DRAFT Guidance for TMDL Implementation Plan Development for Urban/Rural Residential Land Uses within the Coastal Zone Management Area

Addressing the following program requirements: CZARA Section 6217 and Oregon TMDL Rule

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Water Quality Division

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Draft Guidance for TMDL Implementation Plan Development:
Urban/Rural Residential Land Uses Within the Coastal Zone Management Area

DRAFT GUIDANCE FOR TMDL IMPLEMENTATION PLAN DEVELOPMENT FOR URBAN/RURAL RESIDENTIAL LAND USES WITHIN THE COASTAL ZONE MANAGEMENT AREA

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TMDL IMPLEMENTATION PLAN GUIDANCE FOR URBAN/RURAL RESIDENTIAL AREAS WITHIN THE COASTAL ZONE MANAGEMENT AREA

INTRODUCTION

A. Purpose

This document provides guidance for **Designated Management Agencies (DMAs)** within the Coastal Zone Management Area boundary and for the **Oregon Department of Environmental Quality (DEQ)** agency staff on the development and implementation of Total Maximum Daily Load (TMDL) Implementation Plans. TMDL Implementation Plans are developed by DMAs or identified responsible parties to address the pollutants that they are responsible for meeting the goals of the TMDL.

This guidance document for the Coastal Zone Management Area is a supplement to DEQ's current **May 2007 TMDL Implementation Plan Guidance – for State and Local Government Designated Management Agencies** available at http://www.deq.state.or.us/WQ/TMDLs/docs/impl/07wq004tmdlimplplan.pdf

There are three main purposes of the TMDL Implementation Plan Guidance:

1. Provide guidance on how to prepare a TMDL Implementation Plan for the Coastal Zone Management Area that meets the following requirements:
    a. National Ocean and Atmospheric Administration (NOAA) Coastal Zone Management Act (CZMA) under Coastal Zone Act Reauthorization Amendments (CZARA) Section 6217,
    b. Oregon TMDL Rule Requirements (Oregon Administrative Rules (OAR) 340-042-008),
2. Provide guidance on how to prepare a TMDL Implementation Plan for the Coastal Zone Management Area to encourage the incorporation of the following program elements:
    a. U.S. Environmental Protection Agency (EPA)'s Key Watershed Planning Components with Nine Key Nonpoint Source (NPS),
    b. National Pollutant Discharge Elimination System (NPDES) MS4 Stormwater Permit Requirements, if a MS4 Community, and
    c. Drinking Water Protection.
3. Encourage the inclusion of previous water quality related work completed by communities into the TMDL Implementation Plan.

This guidance document is a living document, which will be updated to be current with any State of Oregon or federal legislative changes, court decisions, rule changes promulgated by the Oregon Environmental Quality Commission (EQC), and DEQ policy changes such as Internal Management Directives (IMD).

For questions or comments on this document, please contact your DEQ Basin Coordinator http://www.deq.state.or.us/WQ/TMDLs/docs/basincoordinators.pdf **(Appendix A).**

B Organization and Goals of Guidance

The goal of this guidance is to provide local communities, both cities and counties, with a practical guide to protecting and enhancing water quality through meeting point stormwater and nonpoint pollution reduction requirements. The guidebook includes a description of the requirements under the Oregon's TMDL Rule, 303(d) List, and TMDL process and the Coastal Zone Act Reauthorization Amendments (CZARA) Section 6217 urban management measures. It also includes information that DMAs can use from: the EPA's Key Watershed Planning Components with Nine Key Nonpoint Source (NPS) Elements (Appendix B); the NPDES MS4 Stormwater Permit Requirements, Drinking Water Protection Program Elements, and other information to help understand why these programs are either being asked or recommended of cities and counties.

This is guidance and it is to the responsibility of each DMA to determine how best to comply with state and federal regulations.

The following graphic identifies the key steps in understanding the purpose and use of the guidance document:

C. Background

Oregon relies on the development and implementation of TMDLs as one tool to restore water quality impairments listed in Category 5 of the Oregon Integrated Report (water quality impaired and in need of a TMDL). DEQ has authority to develop TMDLs (OAR 340-042-0025) and require TMDL Implementation Plans from DMAs or other responsible parties (OAR 340-042-0040).

1. Coastal Zone Management Act (CZMA) under CZARA Section 6217

Oregon's Coastal Zone Management Area Nonpoint Pollution Control Program is being developed in compliance with requirements adopted as part of the NOAA Coastal Zone Act Reauthorization Amendments (CZARA) of 1990. The Coastal Zone Management Act (CZMA) is a federal-state partnership program that requires participating coastal states to develop and implement comprehensive coastal management plans designed to balance protection and development in the coastal zone. It was amended by Congress in 1990 to add nonpoint source pollution control programs to state planning efforts.

Section 6217 of CZARA requires that all states with approved CZMA management programs must develop Coastal Nonpoint Source Control Programs containing enforceable policies and mechanisms to implement the management measure requirements of the Coastal Nonpoint Pollution Control Program (1990 CZARA, 16 USC Section 1455(d) (16)) pursuant to EPA and NOAA guidance.

a. The Oregon Coastal Zone Management Area Boundary

Coastal waters are an extremely valuable resource. They provide us with food, recreational opportunities, commerce pathway, and solace. However, they are under increasing pressures from a growing coastal population. Around 16 percent of Oregon's population resides within the Oregon Coastal Zone Management Area Boundary.. The coastal nonpoint program represents a comprehensive approach to polluted runoff, recognizing that all land-use activities in coastal watersheds can have impacts on estuaries, beaches, marine resources, and the ocean.

The entire state of Oregon is 96,000 square miles in size. In Oregon's Coastal Zone Management Area, about 17,000 square miles of the state drains directly into the Pacific Ocean. The 17,000 square mile Coastal Zone Management Area constitutes about 17.7 percent of the entire state. The Oregon Coastal Zone Management Area is roughly all lands west of the crest of the Coast Range, a mountain range that runs parallel to the coastline. At the north end, the area extends up the Columbia River to Puget Island, near the Clatsop-Columbia County line. All lands west of the crest of the Coast Range are in the coastal zone. In the Umpqua and Rogue Basins, the Coastal Zone Management Area includes the whole watersheds. Both of these watersheds extend up to the Cascade Mountains and drain into the Ocean.

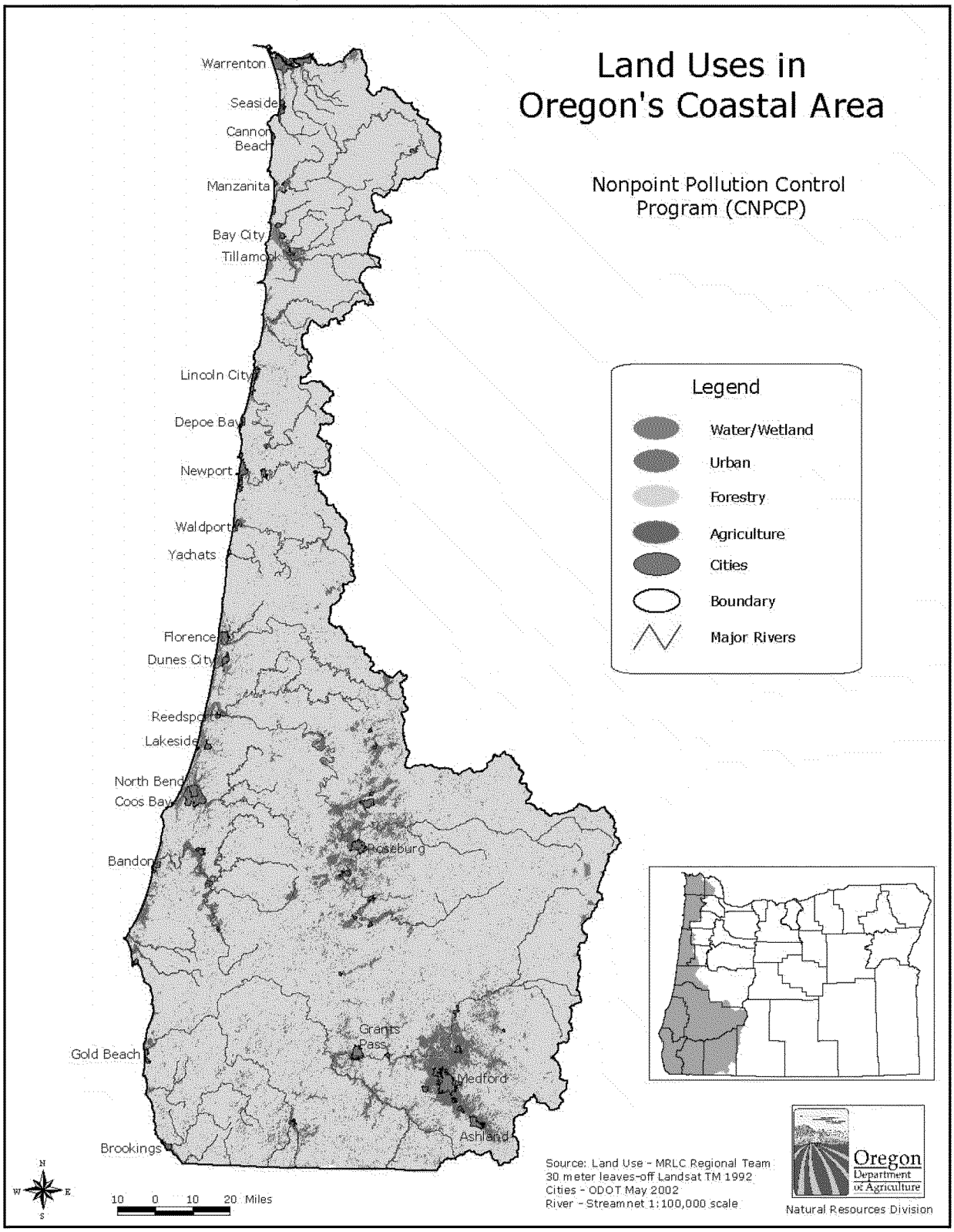
The predominant land use within the Coastal Zone Management Area is forestry, which based on 1992 GIS data, comprises 90 percent of the land area. Urban land uses comprise only 1 percent. The remaining land use types are agriculture with 8 percent coverage and water and wetland at 1 percent.

See **Figures 1 and 2** for a map of the Coastal Zone Management Area and land uses.

Coastal River

Figure 1. Coastal Zone Management Area Boundary

Figure 2. Coastal Zone Management Area Boundary Land Uses



b. Urban Areas Extent of Coverage

The urbanized areas in the Oregon Coastal Zone Management Area are located along U.S. Highway 101 and the southern portion of Interstate Highway 5. Along the coastline, most urbanized areas are located on the edge of an estuary. Highway 101 links several cities from Astoria at the mouth of the Columbia River to Brookings at the mouth of the Chetco. In addition to the cities, there are dozens of unincorporated settlements – some of which are larger than many of the incorporated cities – and hundreds of little clusters of development located along the coastline, estuaries, highways, and rivers. Finally, thousands of rural home sites are located throughout the Coastal Zone Management Area. Since Oregon's Coastal Zone Management Area is host to a healthy recreational industry, and several communities have a high number of vacation homes, the population of several communities fluctuates significantly throughout the year.

Most urban areas in the Oregon Coastal Zone Management Area are located at the lower end of the watersheds along the Coast, or in the case of the Umpqua and Rogue River Basins, are located in the middle portion of their watersheds. The Medford Urbanized Area, which includes the City of Medford, Ashland, Central Point, Phoenix, Jacksonville, Talent, and a portion of Jackson Co. (incl. White City) are EPA "automatically designated" Phase II Stormwater Program communities. For a description of DEQ's NPDES Phase I or Phase II municipal separated storm sewer systems (MS4) program, please refer to DEQ's stormwater website, at ( ).(http://www.deq.state.or.us/wq/stormwater/stormwater.htm).

The table in **Appendix C** contains a list of Coastal Zone Management Area counties, cities, and unincorporated areas, and the 2009 Population. Note that population figures for county and incorporated areas include the whole county, not just that portion included in the Coastal Zone Management Area.

c. Coastal Zone Management Area Urban Management Measures Requirements

There are 15 Coastal Zone Management Area urban management measures to be implemented within the Coastal Zone Management Area boundary as identified in the EPA *"Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, issued under the authority of Section 6217 (g) of The Coastal Zone Act Reauthorization Amendments of 1990"* (hereafter referred to as the *(g) Guidance*) http://www.epa.gov/owow/nps/MMGI/.

Oregon has met 13 out of 15 Management Measures for Urban Areas. However, Oregon has not yet met the *Operating Onsite Disposal Systems Management Measure* (which is not addressed by this guidance document) and the *New Development Management Measure*, which is defined in the *(g) Guidance* as follows:

> ***a. "By design or performance:***
>
> ***1) After construction has been completed and the site is permanently stabilized, reduce the average annual total suspended solid (TSS) loadings by 80 percent. For the purposes of this measure, an 80 percent TSS reduction is to be determined on an average annual basis, or***
>
> ***2) Reduce the post development loadings of TSS so that the average annual TSS loadings are no greater than predevelopment loadings***
>
> ***b. To the extent practicable, maintain post development peak runoff rate and average volume at levels that are similar to pre-development levels."***

Some local jurisdictions in the coastal zone have programs in place that meet the *New Development Management Measures* defined in the *Guidance.* Other jurisdictions do not yet have programs to address these measures.

The Coastal Zone Management Nonpoint Pollution Control Program developed by DEQ and the Department of Land Conservation and Development (DLCD) received conditional approval by NOAA and EPA.

In December 2009, EPA and NOAA received a "Sixty-Day Notice of Intent (NOI) to Sue" from the Washington Forest Law Center on behalf of the Northwest Environmental Advocates (NWEA) due to EPA and NOAA's failure to consult the National Marine Fisheries Service (NMFS) and take final action on Oregon's Coastal Zone Management Nonpoint Pollution Control Program.

DEQ received a letter **(Appendix D)** from NOAA and EPA on May 12, 2010 outlining how Oregon could *"…receive full approval of its Coastal Nonpoint Program".* The letter also stated that "*…If sufficient progress is not being made, EPA and NOAA may disapprove Oregon's program and withhold a portion of the state's Clean Water Act Section 319 and Coastal Zone Management Act Section 306 funding pursuant to 16 U.S.C. Section 1455b(c)."*

The Attachment to the letter identified "*What NOAA and EPA Need from Oregon for Coastal Nonpoint Program Approval".*

<u>For the new development management measure, EPA and NOAA require the following actions:</u>

1. *"Complete TMDL Implementation Guidelines for the Coastal Nonpoint Program management area that incorporate the new development management measure requirements or practices consistent with the new development measure.*

2. *Submit a strategy and schedule for completing and updating TMDL Implementation Plans within the Coastal Nonpoint Program management area to be consistent with the new TMDL Implementation Guidance."*

e. Meeting the CZARA New Development Management Measure

The New Development Management Measure requires meeting TSS and pre-development hydrology measures. These measures are recommended to be met by the urban and rural residential DMAs within the Coastal Zone Management Area through implementation of both programmatic and structural BMPs.

For the Coastal Zone Management Area, the 303(d) listing (2002 and 2004) or TMDL completed for 5 of 22 of the watersheds includes sedimentation. For this guidance document, TSS is considered as part of a sedimentation pollutant listing. In Appendix F, a table lists the TMDLs and 303(d) Listed Pollutants by Waterbody for Urban/Rural Residential DMAs within the Coastal Zone Management Area. For new and updated TMDLs, Implementation Ready TMDLs will be prepared to address a 303(d) listing for sedimentation will use the 4(B) process as identified in DEQ's 303(d) lists (http://www.deq.state.or.us/wq/assessment/rpt0406/search.asp). The Implementation Ready TMDL Water Quality Management Plan (WQMP) will list the specific most effective and other recommended BMPs by pollutant and source in order to meet the 4(b) requirements of "*Other pollution control requirements* [BMPs*] are expected to address all pollutants and will attain water quality standards".*

Section II, F - Table 6 of this guidance document identifies the most effective and other recommended programmatic and structural BMPs by pollutant that will meet the TMDL listed pollutant. There are BMPs for temperature, sedimentation, bacteria, nutrients, aquatic weeds or algae (chlorophyll a), dissolved oxygen, and toxics.

Therefore, for meeting the 80 percent TSS reduction requirement of the New Development Management Measure as identified above., the most effective and other recommended programmatic and structural BMPs for sedimentation are **indicated to meet the TSS** Specifically, the erosion and sediment control programmatic and structural BMPs will meet the this requirement.

To meet the pre-development hydrology requirement, Low Impact Development programmatic and structural BMPs are **indicated to meet the pre-development hydrology requirement**. **Table 1** identifies the BMPs recommended to meet CZARA New Development Management Measure.

DEQ's recommended most effective BMPs are defined as those that if implemented by the DMA, will help ensure compliance with the TMDL. The DMA may select other recommended BMPs in addition to or as replacement of one or more of the most effective BMPs, but will need to show how the other selected BMP(s) will meet the specific pollutant TMDL load allocation.

In **Appendix I,** DEQ has provided the recommended programmatic BMPs by TMDL listed pollutant and source and in **Appendix J** the structural BMPs by TMDL listed pollutant, source, estimated load reduction, costs, and what is included in the costs.

Table 1. BMPs Recommended to Meet CZARA New Development Management Measure

BMPs Recommended to Meet CZARA New Development Management Measure			
TSS (Sediment)			
Most Effective BMPs		**Other Recommended BMPs**	
Programmatic	**Structural**	**Programmatic**	**Structural**
Erosion and Sediment Control Ordinance	Construction Runoff Control/Treatment Facilities	Riparian Protection Ordinance	Riparian Restoration
Low Impact Development (LID) Ordinance	Street Sweeping	Hillside Development (Steep Slopes) Protection Ordinance	Erosion Control BMPs
Stormwater Management Ordinance	Grassed Lined Swales	Floodway and Floodplain Overlay District Ordinance	Stormwater Control/Treatment Facilities
			Stormwater Wetland
			Porous Concrete and/or Asphalt Roads
Pre-Development Hydrology			
Most Effective BMPs		**Other Recommended BMPs**	
Programmatic	**Structural**	**Programmatic**	**Structural**
Low Impact Development (LID) Ordinance	Construction Runoff Control/Treatment Facilities	Stormwater Management Plan	Riparian Restoration
Stormwater Management Ordinance	Stormwater Vegetated Infiltration Basins	Tree Protection Ordinance	Tree Planting
Riparian Protection Ordinance	Grassed Swales		
Wetland Protection Ordinance	Stormwater Wetlands		

2. Using an Integrated Watershed Approach

Water quality improvement requires a comprehensive watershed approach to solving pollution problems. This takes into account the cumulative effects all activities in a watershed have on overall water quality. To solve water quality problems in a stream, river, lake, or estuary, we need to consider the cumulative impact from all upstream sources including groundwater.

Oregon's strategy for improving state surface waters has always been on a watershed basis. The state's National Pollutant Discharge Elimination System (NPDES) permitting, assessment, and TMDL work is aligned and prioritized according to these watersheds. For groundwater areas, there are Groundwater Management Area (GWMA) and basin coordinators assigned to each GWMA and basin/subbasin. They take the lead role as GWMAs and TMDLs are developed and implemented.

DEQ's current Watershed Approach for protecting water quality is to develop TMDLs for both point and nonpoint sources. TMDL implementation is addressed through a variety of mechanisms including Agriculture Water Quality Management Area (AgWQMA) plans, Forest Practices Act, Federal/State Memorandum of Understandings (MOUs), NPDES permits, 401 certification, and plans developed by DMAs or other entities responsible for pollution not addressed by permit. These mechanisms are used to implement the TMDL as outlined in the TMDL WQMP so impaired waters will eventually meet water quality standards.

a. Water Quality Standards and 303(d) Listings

Water Quality Standards

Water quality standards are adopted by the Oregon Environmental Quality Commission (EQC) to protect beneficial uses of the State's waters. Beneficial uses are assigned by basin in the OAR 340, Division 41 (http://arcweb.sos.state.or.us/rules/OARs_300/OAR_340/340_041.html) for water quality.

When a water quality standard is established, the first step is to identify the beneficial uses sensitive to the parameter. Then criteria are established based on the levels needed to protect the sensitive beneficial uses. For example, the uses typically most sensitive to dissolved oxygen are fish and aquatic life. Fish and other aquatic organisms need an adequate supply of oxygen in the water to be healthy and productive. In this case, the criteria identify minimal amounts of dissolved oxygen that need to be in the water to protect the fish.

In other cases, as with many of the toxic pollutants, the criteria may identify the maximum amount that may be in the water without risk to the aquatic biota or to human health. For other parameters, such as bacteria or some toxic compounds, human health is the most sensitive beneficial use.

303(d) Listings

Section 303(d) of the federal CWA requires that waterbodies that violate water quality standards, and thereby fail to fully protect beneficial uses, will be identified, and placed on the 303(d) list. The term "water quality limited" is applied to streams, lakes, and estuaries where violations of State water quality standards occur. The resulting list (the "303(d) list") is a comprehensive catalog of all waterbodies in the state that fail to meet one or more water quality criteria based on available data.

DEQ's 2004/2006 Integrated Report[1] identifies 5 categories that represent varying levels of water quality standards attainment, ranging from Category 1, where all of a water's designated beneficial uses are met, to Category 5, where a pollutant impairs a water and a TMDL is required. These category placements are based on evaluating all existing and readily available data and information consistent with Oregon's assessment methodology.

b. Oregon TMDL Rule (OAR 340-042-008)

Under the Clean Water Act (CFR 130.7) and state statute (ORS 468), the agency is authorized to develop, implement, and enforce TMDLs. TMDLs have been developed and implemented in Oregon since the late 1980's. On December 12, 2002, the EQC adopted the Oregon TMDL rules (OAR 340-042-008) (http://arcweb.sos.state.or.us/rules/OARs_300/OAR_340/340_042.html) **(Appendix E**).

Section 303(d) requires that TMDLs be developed for all waters on the 303(d) list and determine pollution reductions that will meet water quality criteria. The department has the authority to develop TMDLs under Oregon's TMDL rule, OAR 340-042-0025 to 0080. OAR 340-042-0040(4) specifies the elements that are to be included in a TMDL. In addition, DEQ has authority to regulate local governments and entities for urban and rural residential land uses under the TMDL rule

TMDLs are watershed scale water quality and pollutant source analyses that describe the amounts of pollution that a waterbody can receive and still meet applicable water quality standards. A TMDL identifies sources of pollution, the amount of pollution coming from each source, and the amount of reductions needed in order to meet water quality standards. In addition, TMDLs include a safety margin for uncertainty and a reserve capacity for future growth that allows for future discharges to a river or stream in an effort to avoid exceeding water quality standards.

DEQ calculates the TMDLs from mathematical models and other analytical techniques designed to simulate and/or predict complex physical, chemical, and biological processes. Most TMDLs are currently developed at large spatial scales, such as the United States Geological Survey (USGS) 6-digit or 8-digit Hydrologic Unit Code (HUC).

[1] Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act: United States Environmental Protection Agency, (July 21, 2003) http://www.epa.gov/owow/tmdl/tmdl0103/index.html.

The total permissible pollutant load is allocated to point, nonpoint, background, and future sources of pollution, along with a margin of safety. **Wasteload Allocations (WLAs)** are portions of the total load that are allotted to point sources of pollution, such as sewage treatment plants or industrial dischargers. The WLAs are used to establish effluent limits in discharge permits. **Load Allocations (LAs)** are portions of the TMDL that are attributed to natural background sources, such as soils, or from nonpoint sources. Allocations are quantified measures that assure water quality standard compliance. The TMDL is the integration of all developed WLAs and LAs.

The Director of DEQ issues a TMDL as an order. The order is effective and final on the date signed by the Director. Within 20 business days after the Director signs the order, DEQ will notify all affected NPDES permittees, nonpoint source DMAs identified in the TMDL, and persons who provided formal public comment on the draft TMDL that the order has been issued and the summary of responses to comments is available. In addition, the order will identify that there is a 60-day appeal period.

The DEQ letter to DMAs will also identify the need for preparation of TMDL Implementation Plans, which are due 18 months. EPA's timeline for approving a TMDL does not affect the TMDL implementation plan timeline. DEQ may extend a deadline if there is sufficient justification. Once the DMA formally submits a TMDL Implementation Plan to the DEQ, a letter or documentation of receiving should follow. After a 60 day review period DEQ is required to send the DMA a letter of approval which, may contain recommendations for additional actions the DMA should consider or undertake, and DEQ's expectations of issues to be addressed in a future update of the plan.

Appendix F identifies the TMDLs and 303(d) listed pollutants by waterbody for urban and rural residential DMAs within the Coastal Zone Management Area. Temperature and bacteria are the main pollutants on the 303(d) list and TMDLs completed for the majority of waterbodies within the Coastal Zone Management Area. There are a few waterbodies listed for sedimentation and nutrient caused pollutants such as, aquatic weeds, algae and dissolved oxygen. In addition, a few metals listings occur in some of the waterbodies. Refer to **Figure 3** for location of TMDL basins.

Applegate River Mile 8

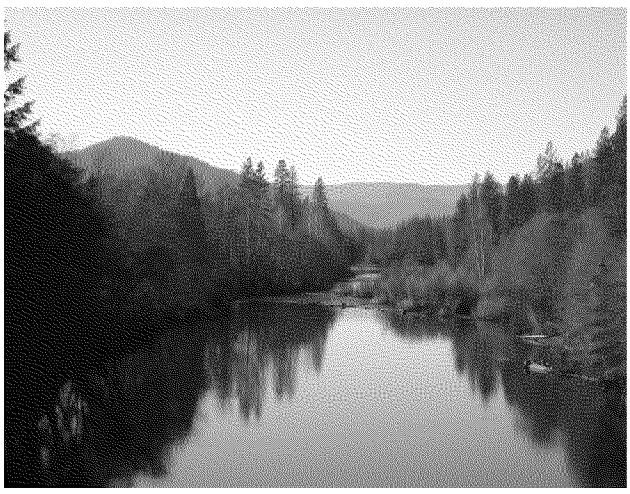
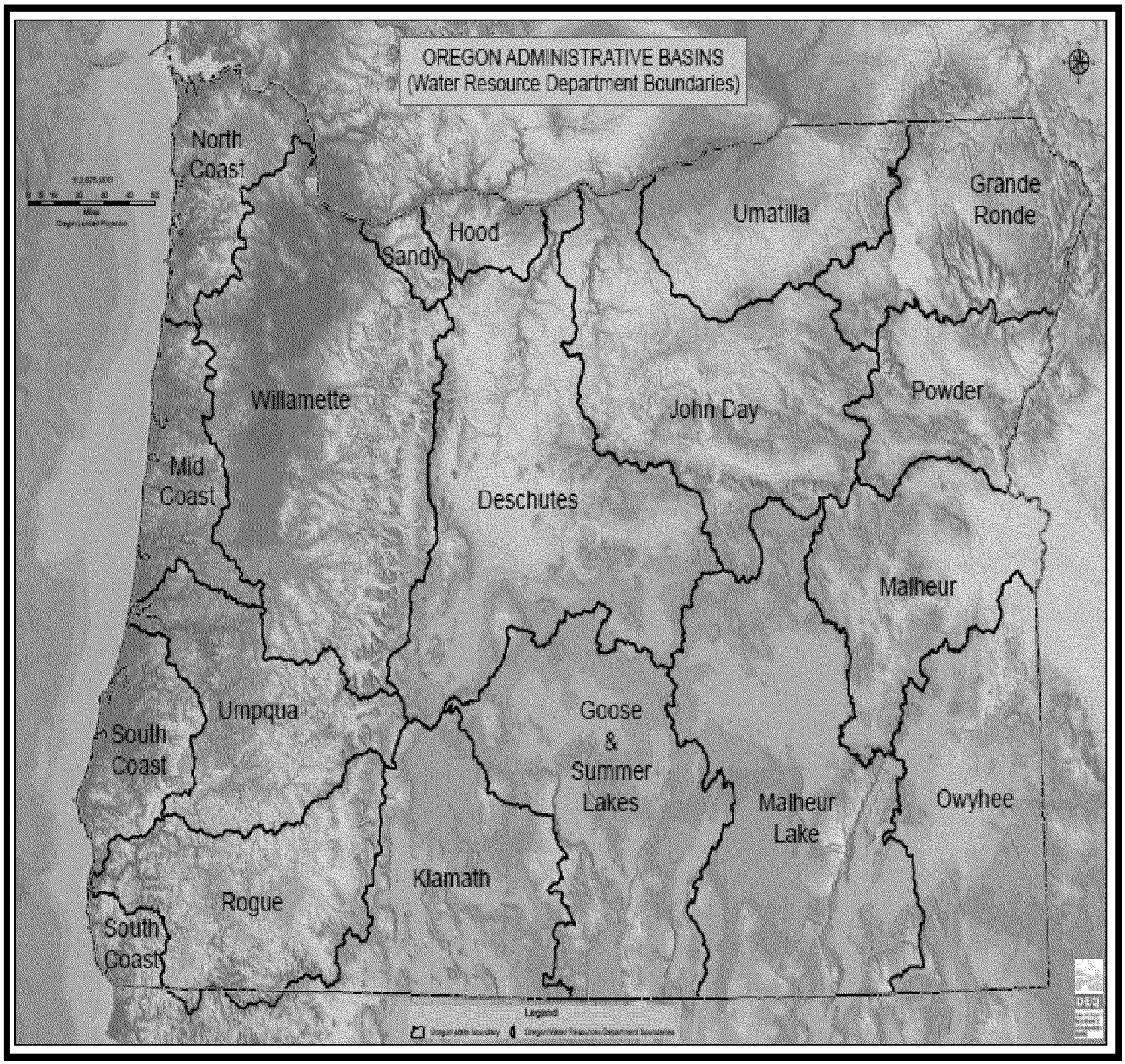


Figure 3. TMDL Basins in Oregon



For each TMDL, a TMDL WQMP is developed to describe a strategy for reducing water pollution to the levels set in the TMDL. OAR 340-042-0050(1) requires DEQ to involve stakeholders in the TMDL process at all levels. The WQMP covers all DMAs within a watershed and includes detailed plans for how individual DMAs intend to work towards meeting the TMDL goals. This mechanism for non-permittee sources of the pollutant are through development of TMDL Implementation Plans (OAR 340-042-0080(3)(a)

The WQMP or the TMDL Implementation Plans should contain the following:

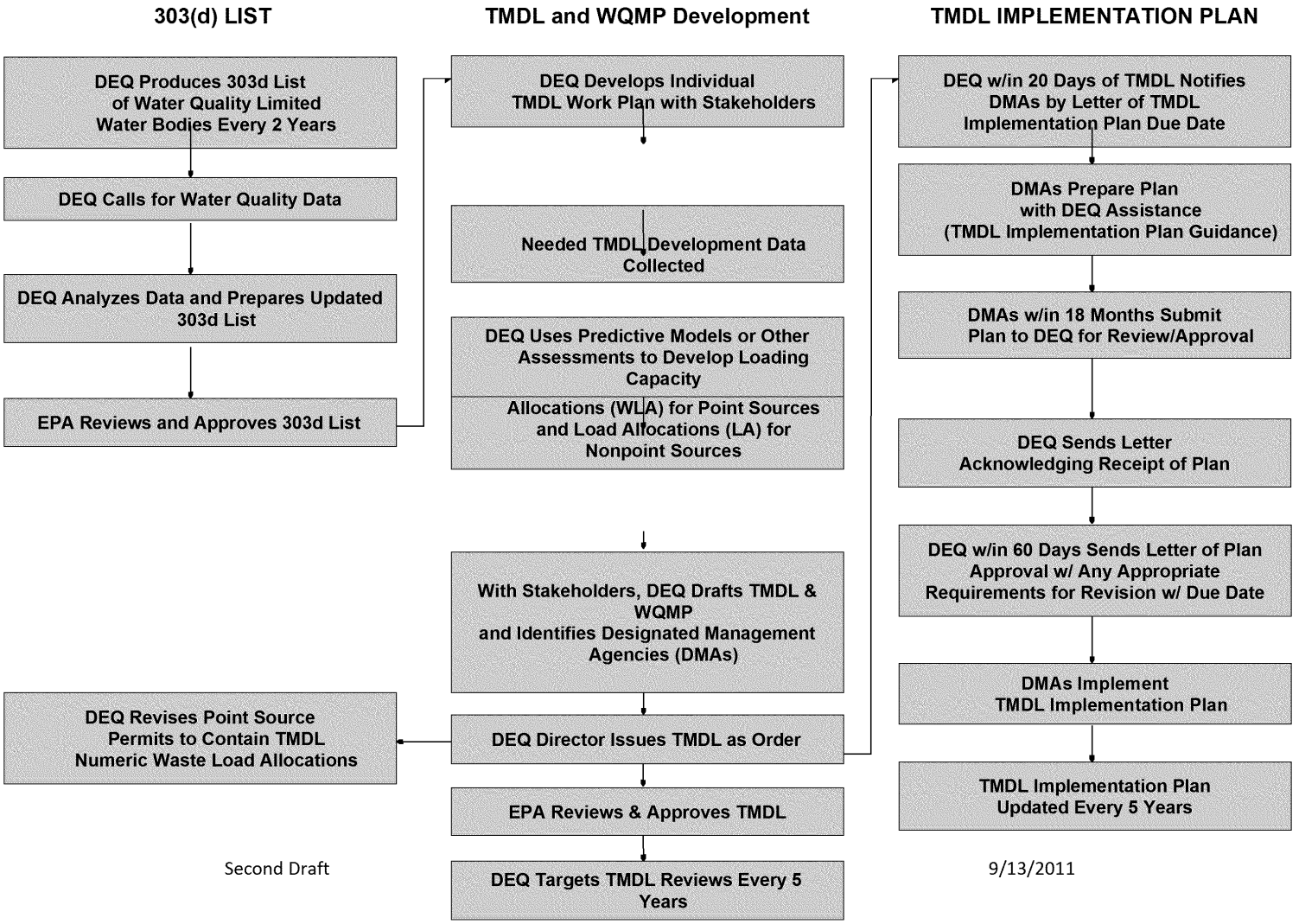
1. Ensure that surrogate measures are clear and easily applied to meet TMDL load allocations,
2. Provide information that could be used to identify priority areas for implementation,
3. Identify management measures needed to achieve TMDL goals,
4. Identify the most effective BMPs for meeting TMDL LA,
5. Set where and when management measures and restoration projects will be implemented to meet water quality restoration milestones,
6. Identify the load reduction that is expected,
7. Develop plans for implementation effectiveness monitoring and tracking,
8. Ensure the monitoring of management measure installation and effectiveness and a process for evaluating management measures and updating them, if necessary,
9. Estimate costs associated with implementation,
10. Determine adequacy of DMA implementation strategies for meeting load allocations,
11. Select implementation strategy that will provide reasonable assurance for achieving water quality goals, and
12. Individual load allocations are given to significant air deposition and land sources of pollutants subject to TMDLs.

When identified as necessary during scoping or watershed planning process, DEQ will develop TMDLs at a smaller spatial scale (10 or 12-digit HUCs); with DMAs and local stakeholder input. The WQMP or TMDL Implementation Plans will be an opportunity for DMAs to work together with DEQ to identify where and when management measures and restoration projects will be implemented.

The flowchart in **Figure 4** identifies TMDL development and TMDL Implementation Plan drafting, issuance, and review process for water quality limited waterbodies associated with urban and rural residential land uses.

Oregon Coastal River

Figure 4. TMDL and WQMP Development and TMDL Implementation Plan Process.



c. EPA's Key Watershed Planning Components with Nine Key NPS Elements

Urban and rural residential DMAs within the Coastal Zone Management Area, which are required to develop TMDL Implementation Plans will need to also meet the Coastal Zone Management Act (CZMA) under CZARA Section 6217 requirements as described above.

In addition, DEQ is recommends, but it is not mandatory, that DMAs prepare their TMDL Implementation Plan to meet EPA's Key Watershed Planning Components and Nine Key NPS elements, EPA's NPDES Phase I or Phase II Stormwater rules (if applicable), and drinking water protection program elements. Doing so will help ensure that the CZARA Section 6217 requirements are being fully met.

EPA has encouraged Oregon to add EPA's nine key NPS element watershed-based plan elements to the current TMDL process following "*EPA's Handbook for Developing Watershed Plans to Restore and Protect Our Waters, EPA 841-B-08-002, March 2008*". (http://www.epa.gov/owow/nps/watershed_handbook/). Based on EPA's past review of several TMDL Implementation Plans, EPA has stated that these plans do not fully meet Section 319 grant (http://www.epa.gov/owow/nps/cwact.html) requirements to develop and implement EPA's nine key NPS element watershed-based plans in impaired waters. DEQ uses the TMDL and DMA required sector or source specific TMDL Implementation Plans in prioritizing and directing 319-project funding to where implementation work is needed.

The table in **Appendix B** identifies EPA's key watershed planning components with the nine key NPS elements.

d. NPDES MS4 Stormwater Permit Requirements

Local jurisdictions within the **Medford Urbanized Area** are DMAs and are regulated under EPA's NPDES Phase I or Phase II Stormwater rules (http://cfpub.epa.gov/npdes/stormwater/munic.cfm) for municipal separated storm sewer systems (MS4)[2].

[2] **Municipal separate storm sewer** (40 CFR 122.26(b)(8)) means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, fabricated channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States;

(ii) Designed or used for collecting or conveying stormwater;

(iii) Which is not a combined sewer; and

(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined in 40 CFR 122.2.

The NPDES stormwater rules require the MS4 permitted community to implement a stormwater management program and to prepare a stormwater management plan (SWMP) in order to reduce the discharge of pollutants into the storm sewer system to the maximum extent practicable. Stormwater runoff may discharge into a municipal system, such as a stormwater pipe, ditch within an MS4 public right-of-way or other conveyance system that collects and discharges into a waterbody.

The TMDL rule requires that all communities, whether a Phase I or II MS4 permitted community or not, to prepare a TMDL Implementation Plan. It is the intent of DEQ that TMDL Implementation Plans include all TMDL listed pollutants. In the case of Phase I MS4 permits, the SWMP must include benchmarks for TMDL listed pollutants and the BMPs necessary to achieve TMDL benchmarks. In addition, for those waterbodies located within a MS4 community that do not yet have a TMDL, the permit requires that all 303(d) listed pollutants must be evaluated to determine whether the SWMP reduces the 303(d) listed pollutant.

See the following **Table 2** for a description of those sources of pollutants that are covered in an MS4s' SWMP and need to be covered in a TMDL Implementation Plan.

Where a TMDL is established for a water body, and waste load allocations are assigned to urban stormwater, the permits will require the contributing MS4 communities to develop benchmarks and performance measures (six total) for the pollutants identified in the TMDL. Fact sheets describing each of the six areas can be found on EPA's Web site: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/.

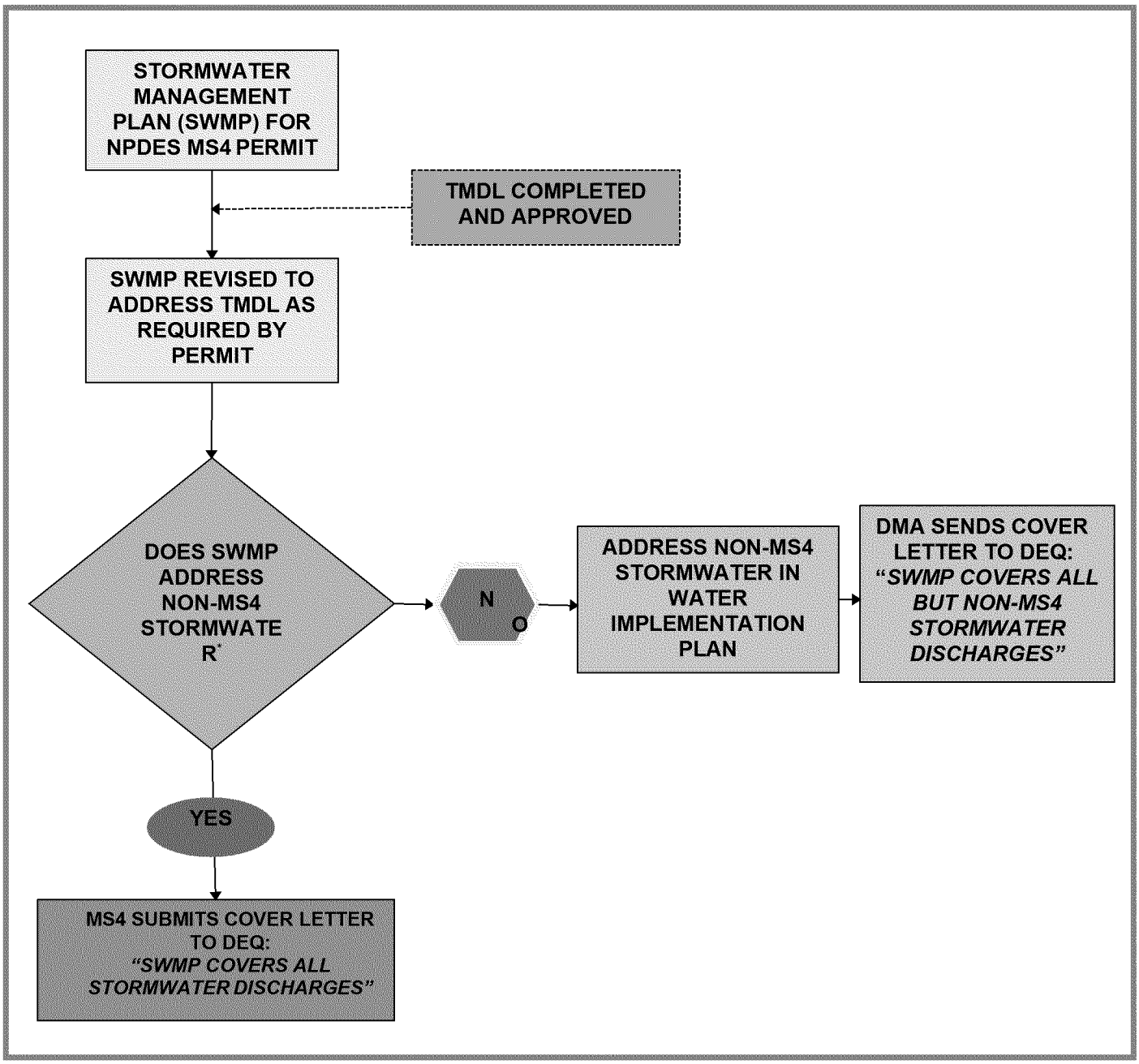
Although discharges of stormwater pollutants into water quality-limited streams are authorized by the proposed permits, the applicants must develop and implement plans designed to reduce the overall pollutant loads from their storm sewer systems. These expected reductions in pollutants allow DEQ to authorize discharges from MS4s without causing additional adverse impacts to water quality-limited water bodies.

Table 2. Permitted MS4s, NPDES Plan vs. TMDL Implementation Plan

Type of Discharge or Environmental Concern	Addressed by NPDES Stormwater Management Plan (SWMP)?	Addressed by TMDL Implementation Plan?
Stormwater Discharges From Municipal System*	**Yes**	**No (refer to SWMP)**
Stormwater Discharged Directly To Receiving Waters (For Example Runoff From a Parking Lot that Flows Overland or Through a Private Pipe)	**No**	**Yes**
Discharges From On-Site Sewage Systems • **Discharges Into MS4** • **Seepage Into Ground Water or Direct to Surface Waters**	**Yes (through MS4 illicit discharge program)** **Unlikely**	**No (refer to SWMP)** **Yes (unless addressed in SWMP)**
Stream Temperature Reduction *(As an example of a pollutant, there may be many others)* • **BMPs To Reduce Temperature of Stormwater Runoff** • **Need For Shading and Riparian Habitat Restoration**	**No**	**Yes**

The following **Figure 5** identifies the steps a Phase I or II stormwater NPDES permitted community would follow in determining the process of meeting TMDL rule requirements:

Figure 5. Stormwater NPDES Permitted Phase I and II MS4s Communities and TMDL Rule Process Flow Chart



* Non-MS4 stormwater discharges are those that are within the MS4 permitted geographically jurisdiction's boundaries but flow directly to surface waters without being conveyed through the jurisdiction's MS4

Within the Coastal Zone Management Area, there are no Phase I communities (however, the Oregon Department of Transportation (ODOT) has a Phase I Permit that includes the Coastal Zone Management Area). For Phase II, the Medford Urbanized Area, which includes the communities of Medford, Ashland, Central Point, Phoenix, Jacksonville, Talent, and a Portion of Jackson Co. (incl. White City) is a MS4 **(See Table 3)**. So far, the communities of Coos Bay, Roseburg, and Grants Pass are the only communities within the Coastal Zone Management Area boundary that are MS4s to be evaluated by DEQ.

Table 3. Communities Within the Coastal Zone Management Area Designated as a Phase II MS4 Stormwater NPDES Community

Phase II MS4 Community (In Urbanized Area)
Medford Urbanized Area
• **Medford**
• **Ashland**
• **Central Point**
• **Phoenix**
• **Jacksonville**
• **Talent**
• **Portion of Jackson Co. (incl. White City)**

f. Drinking Water Protection Program Elements

Approximately 75% of Oregon's citizens get their drinking water from public water systems. The goal of having a healthy source water area, whether from surface or groundwater is accomplished through "drinking water protection" efforts. Mandated by the 1996 Federal Safe Drinking Water Act (SDWA), Source Water Assessments were completed by DEQ and DHS for all systems that have at least 15 hookups, or serve more than 25 people year-round Source Water Assessments for over 1,100 public water systems in Oregon were completed in June 2005.

The assessments include a delineation of the geographic area that supplies the public water system (drinking water protection area) and provide data and information on the potential contamination risks (natural and man-made) associated with the land management activities in the source water areas. Refer to DEQ's drinking water website for more information, http://www.deq.state.or.us/wq/dwp/dwp.htm.

Data from the Source Water Assessments is available to local jurisdictions and the public on DEQ's website at http://www.deq.state.or.us/wq/dwp/results.htm. The data can also be provided as data queries/lists in Access or Excel, GIS layers and/or maps combining information for specific areas of the state. Requests for specific queries of the data should be coordinated through Julie Harvey (Harvey.julie@deq.state.or.us or 503-229-5664). For more information on Source Water Assessment methods, technical assistance, or drinking water protection planning, please visit http://www.deq.state.or.us/wq/dwp/results.htm.

The point and nonpoint contaminant source inventories in the drinking water protection areas provide useful information as the community or agencies evaluate the risks and prioritize protection strategies. Typical contaminant sources identified in groundwater source areas include high-density housing, septic systems, auto repair shops, gas stations, irrigated crops, managed forestland, grazing animals, and transportation corridors. For the public water systems served by surface water, the top five potential contamination sources from the higher risk categories of inventoried sites were managed forests, crops, grazing animals, above ground storage tanks, and auto repair facilities.

Jurisdictions need to protect the quality of the surface and groundwater that supplies their public water system. It is extremely expensive to treat contaminated drinking water or to find an alternative source should a water supply be lost because of contamination. It will continue to be more and more difficult to find funding to address contamination of these water supplies. The cost and burden of treating or replacing the contaminated water supply will generally fall to the local community.

To reduce the risk of contamination, a jurisdiction can determine the land surface area where their drinking water originates, what kind and how many potential contamination sources are within that area, and develop a management approach to reduce the risks of groundwater from those sources. This is a voluntary program in Oregon, which each community can choose to participate.

To assist jurisdictions and communities, DEQ developed a BMPs database for the 88 most common potential contaminant sources in Oregon (available under "technical assistance" in DEQ's DWP website). The database provides activities that range from educational outreach to regulatory approaches that public water systems or communities can take to reduce their risk.

The database can be used to pull the BMPs for a public water system or geographic area from our GIS layers into a format that communities can use to choose their drinking water protection strategies for groundwater or surface water. One of the many BMP's includes evaluating existing setbacks and buffers and considering improvements for enhanced water quality protection. **Table 4** identifies the current setbacks and buffers in Oregon statues and rules for protection of Public Drinking Water Supplies in Oregon.

DEQ's drinking water protection program is actively recommending "Smart Growth" and Low Impact Development (LID) as tools for protecting drinking water - part of focused or regional efforts to achieve water resource management, conservation, and other local water quality goals.

Coastal Riparian Area

Table 4. Setbacks/Buffers for Public Drinking Water Supplies in Oregon.

AGENCY	PROGRAM	STATUTES/ RULES	AREAS OF APPLICATION	SETBACKS OR BUFFERS FOR PUBLIC WATER SYSTEMS[1]
Department of Human Services	**Safe Drinking Water Act**	ORS 448 OAR 333-061-0005 thru 0295	Drinking water standards, regulatory monitoring/enforcement	100' required ownership or easement around well; 100' setback for sewage disposal, solid waste, etc.; 50' setback for septic tanks and pipes
Department of Environmental Quality	**Clean Water Act**	ORS 468/468B OAR 340-040-0140 thru 0210 OAR 340-041-0001 thru 0061	Implements water quality standards in drinking water source areas; CWA applies to all waters of the state	Temperature TMDLs require effective shade targets or some other surrogate for Designated Management Agencies (DMAs)
Department of Land Conservation and Development	**Statewide Land Use Planning Goals**	ORS 197.175 OAR 660-015, 016,023	Implements land use planning rules; Goals 5 and 6 for drinking water	Goal 5 "safe harbor" stream buffers of 50 to 75 feet; however, some comprehensive plans or local ordinances have wider buffer widths following more rigorous Goal 5 guidelines (for example, Josephine County) may apply[2]
Water Resources Department	**Ground Water Act of 1955**	ORS 537 OAR 690-210 and 690-215	Restricts placement of water supply wells	50' setback for septic; 100' for sewage disposal or line; 50' from CAFO; 100' from sewage sludge disposal; 500' from hazardous waste storage[3]

[1] These are statewide setbacks for various land uses or facilities in the DHS and WRD rules.

[2] DLCD rules require riparian protection in comprehensive plans and zoning, including setbacks of 50 to 75 feet or alternative protection methods, but these requirements do not apply to all jurisdictions.

[3] This is a summary of WRD setback requirements. For specifics, please refer to the statutes and rules cited above.

I. TMDL IMPLEMENTATION PLAN

A. Implementation Plan Basics (What, Who, and When)

1. What is a TMDL Implementation Plan?

For city and county DMAs, their TMDL Implementation Plan will address nonpoint pollution sources from urban developments, including all rural developments and rural residential areas. Components of the plan are often implemented by cities and counties through their comprehensive land use plans and development related ordinances and stormwater management facilities in a capital improvement plan. Cities and counties may need to identify implementation actions within their ownerships and plan strategies to restore and enhance high value sites as needed to meet water quality standards.

The plan does not address forestry or agricultural land uses. DMAs are only responsible for land use activities under their jurisdiction.

The TMDL Implementation Plan prepared by each DMA is intended to provide a more site-specific description of the management measures necessary to prevent, control, and/or treat specific sources of the TMDL pollutant such as lack of shading; untreated runoff from residential, commercial, and industrial areas; and erosion from a construction site, etc.

Specifically, for urban and rural residential areas within the Coastal Zone Management Area, the TMDL Implementation Plan is recommended to identify BMPs for a comprehensive stormwater (water quality and quantity) management program to reduce stormwater discharges and associated pollutants. As described above in Section B, Background, (a) Meeting the CZARA New Development Management Measure the BMPs recommended includes construction site erosion and sediment control, post-construction stormwater management for new development and redevelopment, stormwater retrofitting, and implementation strategies for areas within their ownership. For example, in the case of temperature TMDLs, cities and counties may need to assess riparian conditions within their ownerships and plan strategies to protect, restore, and enhance riparian areas.

In addition, DEQ recommends the TMDL Implementation Plan set forth programmatic and structural BMPs that include sufficient detail for the technical design, implementation, maintenance, and effectiveness monitoring over time by the DMA. This may include model ordinances that a city or county could adopt as control measures to meet water quality standards.

The TMDL Implementation Plan is recommended to include estimated BMP load reduction by pollutant and the estimated costs for implementation and/or construction, administration, education/outreach, operation, maintenance, and monitoring. Likewise, specific timelines are recommended to be identified for each of these actions to ensure

that TMDL LA is met within a reasonable timeframe.

2. Who Is Required to Develop and Implement a Plan?

The TMDL WQMP section of a TMDL identifies the entities, called DMAs or responsible parties, which are required to develop and implement plans if their TMDL responsibilities are not already addressed through a prescribed approach or ORS 468B.050 permit requirement. DEQ has the regulatory authority to take enforcement action to compel DMAs to develop TMDL Implementation Plans.

a. Who is a Designated Management Agency (DMA)?

A DMA means a federal, state, or local governmental agency and other entities identified in the Implementation Ready TMDL that has legal authority over a sector or source contributing pollutants, and is identified as such by DEQ in a specific TMDL and the WQMP as responsible for developing source or sector TMDL Implementation Plans.

This most commonly includes cities, counties, U.S. Forest Service, and U.S. Bureau of Land Management, but may also apply to other DMAs that manage significant tracts of land within TMDL boundaries or are otherwise identified as having a significant role in achieving water quality improvements. These could include irrigation or drainage districts, U.S. Fish and Wildlife Service (wildlife refuges), National Park Service, U.S. Army Corps of Engineers, etc.

There are three primary land uses that are sources of nonpoint pollution from which DMAS are identified — forest, agriculture, and urban lands.

Forestry Lands

The rule specifies that if the land is private or state forest, then the Oregon Department of Forestry (ODF) implements the State Forest Practices Act and is the DMA. For federal forestlands, the federal agencies (such the U.S. Forest Service; the Bureau of Land Management; or the U.S. Fish and Wildlife Service for their wildlife refuges) have responsibility to develop Water Quality Restoration Plans (WQRPs) in response to TMDLs.

Agricultural Lands

For agricultural land uses, including hobby farms, Oregon Department of Agriculture (ODA) will work with the landowners in the watershed to devise and implement an Agricultural Water Quality Management Area Plan (AgWQMAP) as regulated by the Agriculture Water Quality Management Act. All agricultural uses and activities are covered by the AgWQMAP, agricultural uses within an Urban Growth Boundary (UGB) could also be covered by the AgWQMAP. Biennial reviews of the AgWQMAP will address new load allocations from TMDLs.

Urban and Rural Lands

For urban areas (which include all urban and rural developments and rural residential areas), cities, and counties are identified as the DMAs. The following definition of urban areas is defined by the Oregon Land Conservation and Development Commission (LCDC) and is used by DEQ to define an Urban and Rural DMA:

LCDC Goal 14 Urban Areas Definition

1. Lands within an "Acknowledged Urban Growth Boundary".
2. Lands within an Unincorporated Community established pursuant to OAR Chapter 660, Division 022.
3. Land in a Destination Resort established pursuant to Statewide Planning Goal 8, Recreational Needs.
4. Land planned and zoned primarily for Rural Industrial or Commercial Use.

LCDC Rural Residential Areas Definition

1. Lands Planned and Zoned Primarily for Rural Residential Uses and for which an exception to Statewide Planning Goal 3, (Agricultural Lands), Goal 4 (Forest Lands), or both was acknowledged before January 1, 2000.

b. What is the role of a DMA?

Implementation of TMDLs is critical to the attainment of water quality standards. The TMDL rule requires the DMAs to prepare and implement a plan that lays out the strategies that will be used to achieve wasteload and load allocations determined in a TMDL.

3. Are Exemptions Available?

DEQ prefers to work with smaller DMAs to develop a customized TMDL Implementation Plan suited to the magnitude of their contribution to the problem rather than consider exemptions. However, DEQ also recognizes that the authority and level of effort necessary to prevent water pollution varies greatly from one DMA to the next. As such, DEQ may elect to exempt specific entities from implementation plan requirements.

Exemptions may be made:

- As part of the TMDL development process and specified in the TMDL WQMP; or
- After the TMDL is adopted, and if DEQ believes, there is sufficient reason to justify an exemption.

Note, however, that an exemption from the plan requirement does not negate the responsibility of the DMA to prevent their activities from violating water quality standards.

4. What is the Plan Submittal Date to DEQ for Approval?

The due date for the TMDL Implementation Plans is described in the WQMP section of each TMDL. Typically, the due date for submitting completed plans is **18 months** following DEQ's issuance of a TMDL. DEQ is required to notify DMAs, affected parties, and others by letter of the plan due date within **20 days** after the TMDL is issued as an EQC Order. EPA's timeline for approving a TMDL does *not* affect the TMDL Implementation Plan timeline. DEQ may extend a deadline required in the WQMP if there is sufficient justification.

5. What does DEQ do Once it Receives a Plan?

DEQ will acknowledge receipt of the plan by letter and will strive to review it within **60 days**. If the plan cannot be reviewed within 60 days, DEQ will let the DMA know when the review will be undertaken.

The plan will be reviewed to ensure that it includes all components and adequately addresses known or suspected sources of pollution under the DMA's jurisdiction. If the plan is found to be unsatisfactory, DEQ will identify which portions of the plan are considered inadequate, return the plan and identify a timeframe for resubmitting the plan. To the extent possible, DEQ will provide resource materials and technical assistance to those needing help to complete the plan.

After receiving a satisfactory plan, DEQ will send the DMA a letter of approval. The approval letter may also include recommendations for additional actions the DMA should consider or undertake, or DEQ's expectations of things to be addressed in a future update of the plan. An example TMDL Implementation Plan timeline is provided in **Table 7 in Section II, H**.

6. What are the TMDL Implementation Plan Approval Criteria?

Once the TMDL Implementation Plan has been received, DEQ will use the following criteria to determine the adequacy of the plan for approval:

- Must meet all of TMDL rule and CZARA Section 6217 elements,
- Addresses all the potential sources of pollution within their jurisdiction of the plan (or referenced in other plans and/or permits),
- The management strategies are reasonably expected to be effective, and
- The DMA demonstrates how the TMDL load allocations will be achieved.

B. Goals and Objectives for TMDL Implementation Plans

The following **Table 5** identifies the goals and objectives of the implementation plan. Note that if the TMDL does not address a particular pollutant, such as sedimentation, the TMDL Implementation Plan is only required to address the pollutant(s) in the TMDL.

Table 5. TMDL Implementation Plan Requirements and Other Recommended Programs to Address in Plan

PROGRAM	REQUIREMENTS
Coastal Zone Act Reauthorization Amendments (CZARA) Section 6217	• Reduce the average annual total suspended solid (TSS) loadings by 80 percent. • Maintain post development peak runoff rate and average volume at levels that are similar to pre-development levels.
Oregon TMDL Rule Requirements (OAR 340-042-008)	• Meet the TMDL Load Allocations (LAs). • Meet Implementation Ready TMDL requirements. • Meet the TMDL Rule regarding plan development and implementation requirements.
PROGRAM	**RECOMMENDED TO BE ADDRESSED IN PLAN**
EPA's Key Watershed Planning Components with Nine Key NPS Elements	• Element 1: Include TMDL description. • Element 2: Determine the pollutant load reductions needed to meet LAs. • Element 3: Identify management measures, incl. sensitive areas, to achieve the LAs. • Element 4: Estimate the costs to implement the plan and the sources and amounts of financial and technical assistance. • Element 5: Identify the information/education activities needed for implementing the plan. • Element 6: Develop a schedule for implementing the plan. • Element 7: Develop measurable milestones for determining whether management measures are being implemented. • Element 8: For reasonable assurance requirements, determine whether loading reductions are being achieved and specify what measures will be taken if progress has not been demonstrated. • Element 9: Develop an effectiveness/performance monitoring component and identify how changes will be made to plan

Table 5. TMDL Implementation Plan Requirements and Other Recommended Programs to Address in Plan (Cont.)

PROGRAM	RECOMMENDED TO BE ADDRESSED IN PLAN
National Pollutant Discharge Elimination System (NPDES) MS4 Stormwater Permit Requirements, if a MS4 Community	• If a Phase I or II MS4 community, prepare a TMDL Implementation Plan or add to the NPDES required Stormwater Management Plan to meet the TMDL Implementation Plan requirements.
Drinking Water Protection Program Elements	• Meet the setbacks and buffers requirements **(Table 4)** for protection of Public Drinking Water Supplies in Oregon.

C. General Considerations During Plan Development

1. Where to Start

Prior to selecting management strategies, the DMA should review the TMDL WQMP for a list of management strategies that are recommended to be used to control sources of pollution. DEQ will also be available to provide assistance in identifying sources as well as potential management strategies.

2. Build Upon other Water Quality Protection Efforts

TMDL Implementation Plans describe the actions that DMAs will undertake to reduce pollution in order to help restore and protect water quality. Many of the DMAs – municipalities, counties, land managers, ODA, ODF, and others – already have water quality plan or strategies in place that help prevent or control water pollution, such as stormwater management plans or road maintenance plans, but these plans may not address all of the TMDL pollutants or cover all relevant sources of pollution. TMDL Implementation Plans should *build* upon these efforts.

Plans should reference existing activities and describe any additional strategies that will be undertaken in order to achieve the pollution reductions described in the TMDL. DEQ has prepared the *Inventory of Water Resource Management Activities* in **Appendix G** that provides a questionnaire to identify planning and management activities already underway that might support the TMDL implementation effort. These are recommended to be incorporated as actions within the TMDL Implementation Plan.

The TMDL Implementation Plan is recommended and encouraged to build upon previous water quality related work including structural and non-structural measures completed or planned by cities and counties. Note that these plans do not substitute for

the TMDL Implementation Plan itself. Water quality programs with applicable plans may include the following water quality, land use, habitat management, and other programs within a particular watershed:

- Oregon Coastal Nonpoint Pollution Control Program (CNPCP)
- EPA NPDES Stormwater Phase I and II Permit Stormwater Management Plans (SWMP)
- DEQ NPDES 1200-C Construction Stormwater Permit
- 401 Water Quality Certification Program (with required Stormwater and Erosion Control Plans)
- DEQ Underground Injection Control (UIC) Program (with required Stormwater Management Plan)
- DEQ Onsite Program
- Drinking Water Source Water Protection Program Source Water Assessments and Protection
- Clean Water State Revolving Fund (CWSRF)
- 319 NPS and NOAA NPS Grants
- Watershed Council's OWEB funded Watershed Management Plan
- Approved Local Land Use Plans and Water Quality Related Development Ordinances
- State Land Use Planning Program Goals and Guidelines Compliance (DLCD)
- Wetlands Planning and Department of State Lands Oregon's Removal-Fill Permit
- NMFS Endangered Species Act (ESA), Section 4(d) Rule

3. Adopt a Long Term Vision

The centerpiece of a TMDL Implementation Plan is a list of ongoing and planned activities that will be undertaken to achieve the TMDL pollutant reductions. This list is accompanied by a timeline for implementing the actions and methods for assessing effectiveness.

DEQ expects that the strategies and timelines in a TMDL Implementation Plan will ultimately be successful in meeting the pollution reduction goals. DEQ recognizes, however, that pollution prevention at times can be an uncertain science and the pathway to implementing some of these strategies may also be uncertain due to availability of funds, level of public support, etc. As such, DEQ expects that the DMA will implement the plan to the best of its abilities but acknowledges that reasonable and prudent judgment will make adjustments or revisions necessary from time to time.

The implementation plan must also indicate how the DMA will continue efforts over the long term to further reduce pollution contributions in order to fully achieve the TMDL requirements and ensure the desired levels of protection will be maintained. Long-term success is largely dependent upon having adequate pollution prevention mechanisms in

place [e.g., erosion control BMPs, riparian protection strategies, stormwater management strategies] and a well-defined process for adaptive management.

As EPA noted in their May 12, 2010, **Guidance for Federal Land Management in the Chesapeake Bay Watershed,** http://www.epa.gov/owow_keep/NPS/chesbay502/**,** *"…there are differing views on the inevitability of continued rapid growth, most jurisdictions will find it essential to plan for significant growth. In areas where water quality standards are barely attained, or where there are impairments, incorporating the impacts from growth into the planning process is critical.*

For example, if 100 acres of forested land are going to be replaced by residential development, nutrient loads are certain to increase. If a pending or existing TMDL implies the need to reduce nutrient loads, one might ask how it is that an increase is being allowed when the current loads are already too high. It is with that vexing question in mind that this guidance is being advanced.

This guidance proposes a simple two-part answer. First, develop an analysis showing that the excessive pollutants can be reduced to achieve the TMDL. Second, develop a technical and administrative framework for offsetting new loads.

In the simple case above, 100 acres of forested land with a unit nitrogen-loading rate of 1.5 lbs/acre/yr is going to be converted to urban land with a loading rate of 7.5 lbs/acre/yr. According to figures provided by the Chesapeake Bay Program, the resultant nonpoint source nitrogen load is going to increase by about (7.5 – 1.5) lbs/acre/yr x 100 acres = 600 lbs/yr. In addition, if the development consists of 100 residential units, each generating about 250 gallons of municipal waste per day, another 304 lbs/yr will be generated for a total nitrogen increase of about 904 lbs/yr."

4. Identify, Prioritize, and Fund Appropriate Strategies

Depending upon the pollutant source being addressed, the appropriate strategy will vary. Some strategies can be implemented immediately (e.g., changing BMPs for maintaining roadside ditches) while others will require more evaluation before an effective strategy can be determined (e.g., determining whether bacteria is coming from failing septic systems). Some strategies may require a significant public process (e.g., adopting a new ordinance or including stormwater management facilities in a capital improvement plan) while others can be undertaken relatively quickly (e.g., information/education efforts or changes in road maintenance programs).

In some instances, it may be necessary for DMAs to prioritize among the strategies, if resources are limited. This may mean addressing some sources of pollution before others or focusing implementation efforts in a particular geographic area. To the extent possible, the selection of priorities should be driven by the greatest opportunities for achieving pollutant reductions.

DMAs will also need to conduct a fiscal analysis to determine what additional resources are necessary to develop, implement, and maintain the management strategies, and

how these resources will be obtained. The results of this analysis should be described in the implementation plan.

5. DEQ Expectations: Adaptive Management

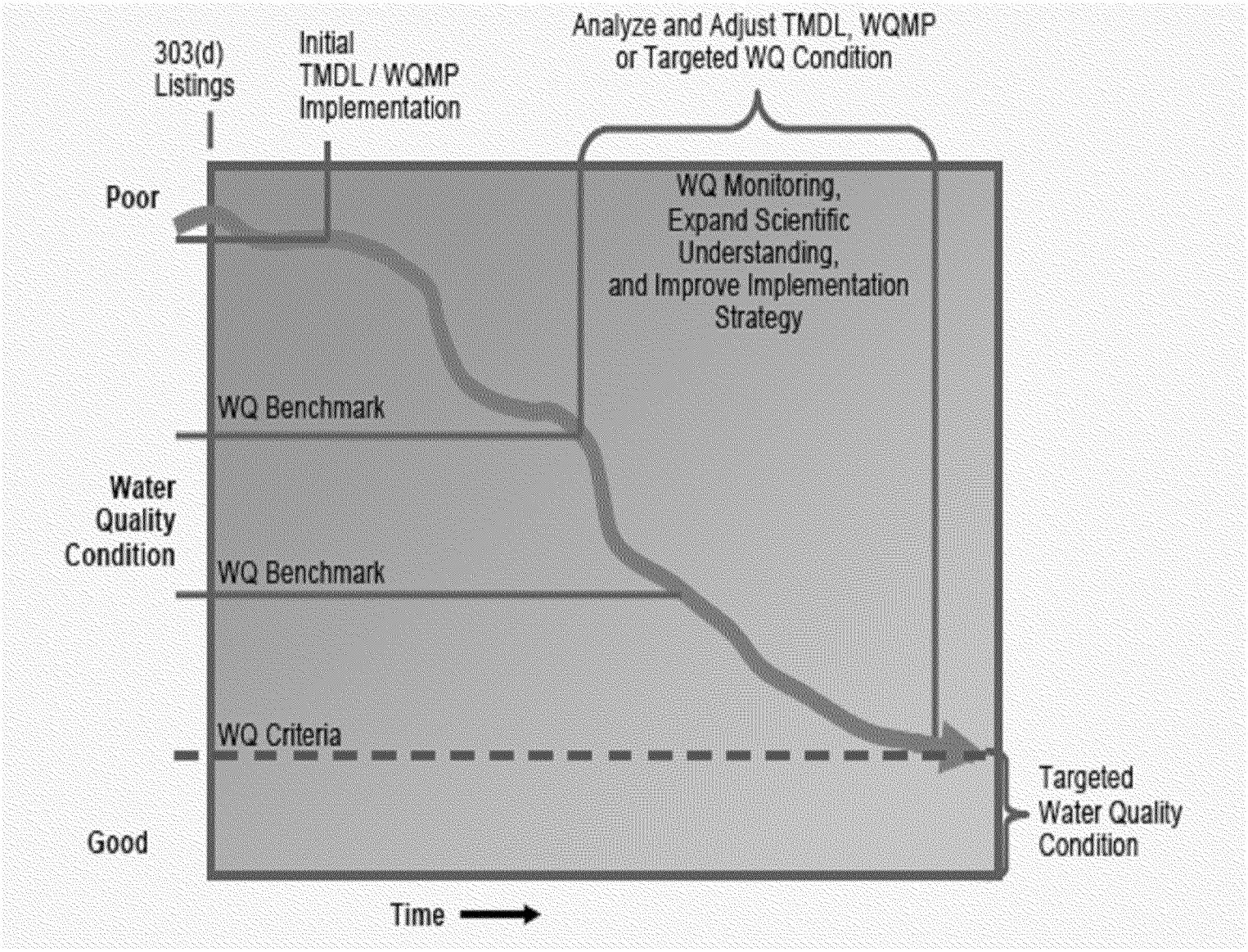
DEQ expects many of the water pollution problems being addressed through TMDLs will take several years or decades to be resolved. Where implementation of the TMDL Implementation Plan or effectiveness of management techniques is found to be inadequate; DEQ expects management agencies to revise the components of the implementation plan to address these deficiencies. Through adaptive management, DEQ expects that the adequacy of these activities will be monitored and modified over time as needed.

Pollution reduction plans, whether for a broad area or specific site, tend to have an opportunistic component. That is, for reasons of practicality and efficiency, implementation plans adapt to the realities on the ground, such as the willingness of particular property owners to participate, the availability of particular funding, or physical constraints. The greater the investment in advance planning, the greater the certainty of the final result.

For complex situations, an adaptive management approach for implementation planning is often practical and helps to set reasonable expectations. This implies that post-implementation evaluation may need to be an explicit component of executing the implementation plan, and most likely be incorporated into the funding of the plan. This can often be done through various milestones for measuring progress and for preventing future load increases, funding for post-evaluation, and implementation refinements. It is almost certain that follow-up steps will be needed to achieve full implementation.

When DEQ, in consultation with the DMAs, concludes that all feasible steps have been taken to meet the TMDL and attainment of water quality standards, the TMDL, or the associated surrogates is not practicable, it will reopen the TMDL and revise it as appropriate. DEQ would also consider re-opening the TMDL should new information become available indicating that the TMDL or its associated surrogates should be modified. **Figure 6** provides a graphic description of the adaptive management process.

Figure 6. DEQ Adaptive Management Process



D. Funding, Technical, and Outreach Assistance Available

DEQ is aware of the difficulty that many communities, particularly the smaller communities, will have in developing and implementing the TMDL Implementation Plan management measures. DEQ staff will continue to provide assistance to DMAs in the development and implementation of the TMDL Implementation Plan. The form of this assistance includes technical, funding, and public education and involvement.

It is the responsibility of the DMAs to fund the development and implementation of the implementation plan. DEQ will provide as much of the limited funds and staffing assistance available to DMAs for implementation of the TMDL Implementation Plan. There are numerous funding sources available for cities and counties. Please refer to **Appendix H** for a description, web links, and how to apply for these funding programs:

- Oregon DEQ - 319 Nonpoint Source Grants
- Oregon DEQ - Clean Water State Revolving Fund
- Oregon Health Authority, Public Health Division, Office of Environmental Public Health, Drinking Water Program and the Oregon Business Development Department - Safe Drinking Water Revolving Loan Fund (SDWRLF)
- Department of Land Conservation and Development (DLCD) - Oregon Coastal Management Program (OCMP)
- Oregon Watershed Enhancement Board (OWEB) - Grants
- Oregon Department of Fish and Wildlife (ODFW) - Access and Habitat
- ODFW - The Riparian Tax Incentive Program
- U.S. Fish and Wildlife Service - Partners for Fish and Wildlife Program

E. Plan Implementation and Reporting Requirements

1. Plan Implementation

a. Implementation Responsibilities

All DMAs who are to submit a TMDL Implementation Plan are expected to implement and revise the plan as needed. DEQ will make every attempt to work collaboratively with DMAs to help them achieve compliance.

b. Accommodating Plan Changes

As such, DEQ expects that the DMA will implement the plan to the best of its abilities but acknowledges that reasonable and prudent judgment will make adjustments or revisions necessary from time to time. The DMA should keep DEQ apprised of the changes. In most instances, it will be adequate to wait for the next **5-year review** of the plan to revise it to reflect the changes.

2. Reporting Requirements

Generally, two reports are recommended to be submitted to DEQ on a regular basis.

1. Annual Progress Report

This report tracks implementation of each management strategy. Typically, the TMDL WQMP specifies the frequency of reporting. If there is no frequency specified in the WQMP, a progress report should be submitted to DEQ ***once a year***.

The (Annual) Progress Report may include:

- The status of compliance with permit conditions, an assessment of the appropriateness of your identified BMPs and progress towards achieving your identified measurable goals for each of the minimum control measures;
- Results of information collected and analyzed, including monitoring data, if any, during the reporting period;
- A summary of the stormwater activities you plan to undertake during the next reporting cycle;
- A change in any identified BMPs or measurable goals for any of the minimum control measures; and
- Notice that you are relying on another governmental entity to satisfy some of your permit obligations (if applicable).

2. 5-Year Implementation Plan Review Report

All DMAs are expected to review ***every five years*** and, if necessary, revise their implementation plan. A 5-Year Implementation Plan Review Report with suggested revisions should be sent to DEQ for approval.

F. Tracking Implementation of TMDL Implementation Plan

1. Tracking

DEQ has prepared the TMDL Implementation Tracking Matrix, which is a template for DMAs to describe and report management activities in their annual reports to DEQ. DEQ encourages the use of this matrix for organizing the implementation plan and tracking progress of the management measures. Additional details on each strategy can be included in a narrative portion of the plan.

2. Timeline For Strategies and Measurable Milestones

A schedule for completing measurable milestones should be included. For example, if the adoption of an ordinance is proposed to require pet owners to pick up their pet waste, measurable milestones may include dates for public review of the proposed ordinance and ordinance adoption.

I. Compliance and Enforcement

The TMDL is issued as an Order and identifies all DMAs required to submit a TMDL Implementation Plan to DEQ for approval. The DMA has 60 days from the issuance of the TMDL to appeal the issuance of the TMDL.

DMAs or sources specifically named in the TMDL or WQMP as needing to submit a TMDL Implementation Plan may be subject to DEQ enforcement action for failure to submit or receive approval of a TMDL Implementation Plan that was required in the TMDL or WQMP, or for failure to implement an approved TMDL Implementation Plan.

In addition, DMAs such as local, state, and federal agencies have the authority to enforce on implementation of TMDLs through their implementation plans. If efforts to make the necessary revisions fail, DEQ could assign TMDL load allocations to specific sources or sectors and require TMDL implementation plans of those sources identified.

Step 1: Notification to DMA.

Within 20 days of issuing the TMDL, DEQ sends a letter to each DMA indicating when a TMDL Implementation Plan must be submitted to DEQ. The due date is specified in the TMDL.

Step 2: Interim Activities Until Due Date of TMDL Implementation Plan.

After Step 1 and until the TMDL Implementation Plan is due, the DEQ TMDL basin coordinator will periodically check in with each DMA to determine progress and provide technical assistance as necessary. If there are indications that a DMA will not meet the due date for Plan submission to DEQ, DEQ will send a letter to the DMA to explain

DEQ's concerns. If it is beyond the DMA's reasonable control to meet the submission deadline, DEQ may consider entering into a Mutual Agreement and Order that would give the DMA more time to develop its Plan. DEQ staff should confer with OCE before offering to negotiate a MAO with a DMA.

Step 3: Warning Letter with Opportunity to Correct.

Failure of the DMA to submit its TMDL Implementation Plan on time is a Class II violation. Class I violations are considered to be the most serious violations and Class III violations are the least serious. The enforcement guidance requires DEQ to send the DMA a Warning Letter with Opportunity to Correct requesting that the DMA submit a Plan or an acceptable proposed schedule for completion of a Plan by a specified date. The Warning Letter states that if the DMA does not correct the violation, the violation may be referred for formal enforcement action that could include civil penalties and a compliance order.

(Note: If the plan is not received by DEQ by the requested time, then Step 4 will be instituted. Moreover, if the response to the Warning Letter includes an unacceptably long alternative schedule, a follow-up letter will be sent indicating that the DMA needs to modify its schedule. Finally, if the DMA does not submit a new date, DEQ will identify a new submittal date in a Department Order (Step 5).

Step 4: Pre-Enforcement Notice.

If the TMDL Implementation Plan is not submitted within the period indicated in the Warning Letter, or if the response is inadequate, DEQ will send the DMA a Pre-Enforcement Notice. This letter indicates that the matter has been referred to DEQ's Office of Compliance and Enforcement for formal enforcement action that may include issuance of a civil penalty assessment and a Department Order. Concurrent with the Pre-Enforcement Notice, DEQ staff will send an enforcement referral to DEQ's Office of Compliance and Enforcement.

Step 5: Implementation of the DEQ-Approved TMDL Implementation Plan.

Once DEQ has approved the TMDL Implementation Plan, the DMA is required to implement the Plan. Failure by a DMA to comply with its approved Water Quality Implementation Plan is a Class II violation. DEQ's enforcement guidance, on how DEQ will handle this violation, is the same as discussed above under Step 3 (for failure to timely submit a Plan).

Erosion Down a Road

II. CONTENT OF THE TMDL IMPLEMENTATION PLAN

TABLE OF CONTENTS

FIGURES

TABLES

ACKNOWLEDGMENTS

EXECUTIVE SUMMARY

A. INTRODUCTION (*EPA's Key Watershed Planning Components with Nine Key NPS Elements)*

What information should be provided?
The reasons for the TMDL Implementation Plan, its goals and purpose, and other background information.

Why should this be included?
Although not required, it is helpful to provide this context so that the people who read the plan understand what it is for.

Where can this information be found?
This information can be drawn directly from the TMDL and customized for the DMA's jurisdiction.

EXAMPLE (based on the Willamette TMDL WQMP):

The Willamette River and numerous tributaries do not currently meet several water quality standards including bacteria, mercury, and temperature. These standards assure that beneficial uses of the river and tributaries, such as swimming, fish consumption, and fish rearing, are protected. When water quality standards are not met, the federal Clean Water Act requires a Total Maximum Daily Load (TMDL) to be established. A TMDL determines how much pollution can be added to the river without exceeding water quality standards.

On September 21, 2006, the Oregon Department of Environmental Quality (DEQ) issued the Willamette Basin TMDL as an Order, and submitted the TMDL to the Environmental Protection Agency (EPA) for approval. As part of the Willamette TMDL, DEQ developed a Water Quality Management Plan (WQMP) to describe the overall framework for implementing the Willamette Basin TMDL. The WQMP includes a description of activities, programs, legal authorities and other measures for which DEQ and other Designated Management Agencies (DMAs) have regulatory responsibility. The WQMP identifies the sector and source-specific implementation plans required and the persons, including DMAs, responsible for developing and revising those plans.

A DMA is "a federal, state, or local governmental agency that has legal authority of a sector or source contributing pollutants, and is identified as such by the Department of Environmental Quality in a TMDL". TMDL implementation activities will be carried out under existing regulatory authorities, programs and water quality restoration plans as well as by sector or source specific plans that certain DMAs will develop in fulfillment of the requirements of this TMDL. Along with other cities and agencies in the Willamette Basin, [name of DMA) has been named by DEQ as a DMA in that it has legal authority over a sector or source contributing pollutants on the XXX acres within the City's limits, and in that it operates a sewage treatment plant with a permit to discharge treated effluent into the XXX River, which flows for about XX miles through the length of the City. The XX River is currently listed as a water quality limited river due to [e.g. elevated summer temperatures, elevated bacteria levels]. As such, [name of DMA] is required to develop a TMDL implementation plan for review and approval by DEQ.

TMDLs, the WQMP, and associated implementation plans and activities are designed to restore water quality to comply with water quality standards. In this way, designated beneficial uses, such as aquatic life, drinking water supplies, and water contact recreation, will be protected. When implemented, the TMDL will result in a cleaner, healthier Willamette river for current and future generations.

B. PUBLIC PARTICIPATION (*OAR 340-042-0040 (4) (l) (L) and OAR 340-042-0080 (3) (a) (E), and EPA's Key Watershed Planning Components with Nine Key NPS Elements and EPA NPDES Phase I and II Stormwater Rules*)

What information should be provided?
The public participation section of the implementation plan is recommended to describe the approaches, which will be used to inform the public and to solicit input. These may include:

- Public Meetings;
- Focus Groups;
- A Steering Committee;
- Websites;
- The Media, and
- Mailings.

Public meetings provide a forum whereby the general public can be informed as to the TMDL requirements, how the implementation plan will be developed, and what actions that may be required. Focus groups provide a way for a smaller numbers of individuals within the community to come together to address specific implementation issues. A steering committee to consider recommendations that are formulated by the focus groups and to provide overall oversight to the process is also recommended. Other watershed-specific approaches may be developed as well.

Another important coordination issue is when multi-jurisdictional coordination is warranted. Begin engaging neighboring jurisdictions on these issues through your steering committee framework. Finally, solicit early DEQ facilitation of inter-jurisdictional dialogue on complex implementation issues. Failure to bring the state in early could result in time-sensitive decisions being made in a crisis mode, which is likely to result in less than ideal outcomes.

THINGS TO CONSIDER IN FORMULATING A PUBLIC PARTICIPATION PROCESS:

- **What partnerships currently exist in the watershed that could enhance public participation?**
- **What media campaigns are currently in place that could enhance public understanding?**
- **What are the target audiences in the watershed?**
- **What are the concerns and priorities of the target audiences?**
- **Which strategies are best suited for reaching and engaging the public in this watershed?**

Source: Guidance Manual for Total Maximum Daily Load Implementation Plans, The Commonwealth of Virginia: Department of Conservation and Recreation, Department of Environmental Quality, July 2003

Why should this be included?

An essential step in implementing and developing a TMDL Implementation Plan is the input from a broad range of individuals, agencies, organizations, and businesses because of their interest and familiarity with local water quality needs and conditions. Public participation facilitates dialogue between individuals, watershed councils and other non-profits, community, and government groups to commit resources to implementation, such as funding and technical support.

Where can this information be found?

The public participation process for the implementation plan in many cases may be identifying and describing the ongoing partnerships and public review and input that the DMA currently uses in the watershed on a much smaller geographical scale.

EXAMPLE (based on Fanno and Tryon Creeks Watershed Management Plan, Chapter 22 Tryon Creek Watershed Strategies and Actions, by City of Portland, Bureau of Environmental Services, 2005):

Public Involvement

Active neighborhood groups provide collaborative restoration, education and technical assistance opportunities for local area residents. Partners include SW Neighborhoods, Inc (SWNI), Crestwood Neighborhood Association, Friends of Woods Park, Portland Parks and Recreation, and BES Community Watershed Stewardship Grants and Watershed Revegetation programs.

Active stewardship sites include Woods Park. BES' revegetation program has active sites at April Hill and Woods Park and in cooperation with homeowners just downstream of April Hill. Free programs such as Naturescaping for Clean Rivers are available to raise awareness about how individual actions, such as landscaping practices and pesticide use, influence watershed health. Additional public outreach steps could include placing curb markings to discourage dumping in storm drains.

C. GEOGRAPHIC EXTENT OF THE WATERSHED(S) COVERED BY THE PLAN (MAP AND DESCRIPTION) (*OAR 340-042-0040 (4) (a) and OAR 340-042-0080 (3) (a) (E), EPA's Key Watershed Planning Components, with Nine Key NPS Elements and EPA NPDES Phase I and II Stormwater Rules*)

What information should be provided?
Provide a map of waterbodies within or near the DMA's jurisdiction that may be affected by activities within the jurisdiction, including waterbodies receiving runoff from the jurisdiction. In addition, map all other environmentally sensitive areas such as:

- Rivers and Streams
- Riparian Areas
- Floodplains
- Springs and Seeps
- Wetlands
- Tidal and Non-Tidal Wetlands
- Forests
- Steep Slopes
- Highly Erodible Soils
- Topography

Why should this be included?
Having a description of the geographic extent of the watershed(s) covered by the plan with a map is helpful to provide this context so that a reader of the plan understands its purpose. These map(s) will be used to determine the BMPs needed to meet the TMDL and to develop the TMDL Implementation Plan.

The following figures are example maps that identify the existing streams, wetlands, piped surface water systems, and flood hazard areas within the City of Portland, Johnson Creek/Powell Butte watershed.

Where can this information be found?
This information can be drawn directly from the TMDL WQMP and other federal, state, and local natural resource agencies, customized for the DMA's jurisdiction.

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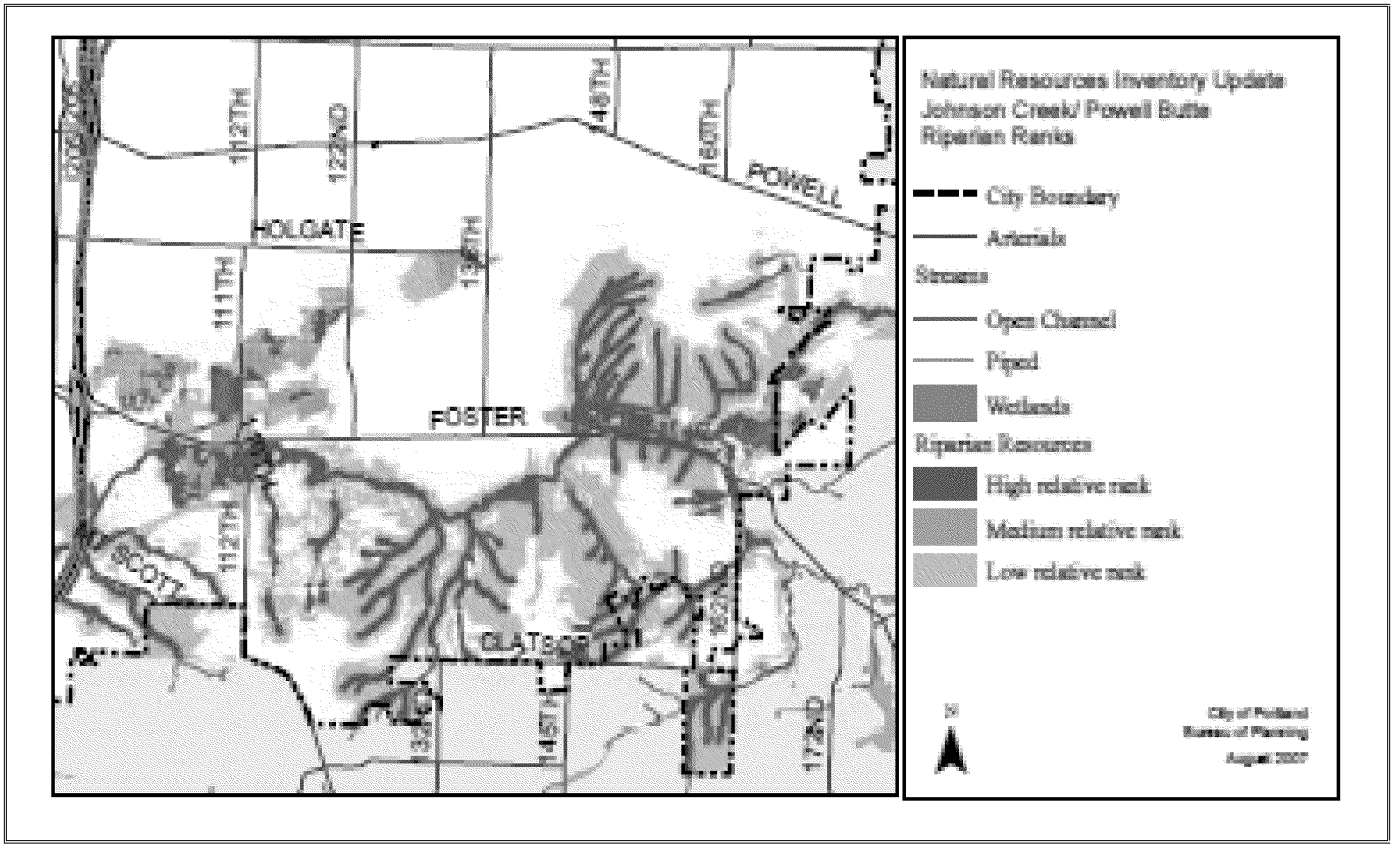
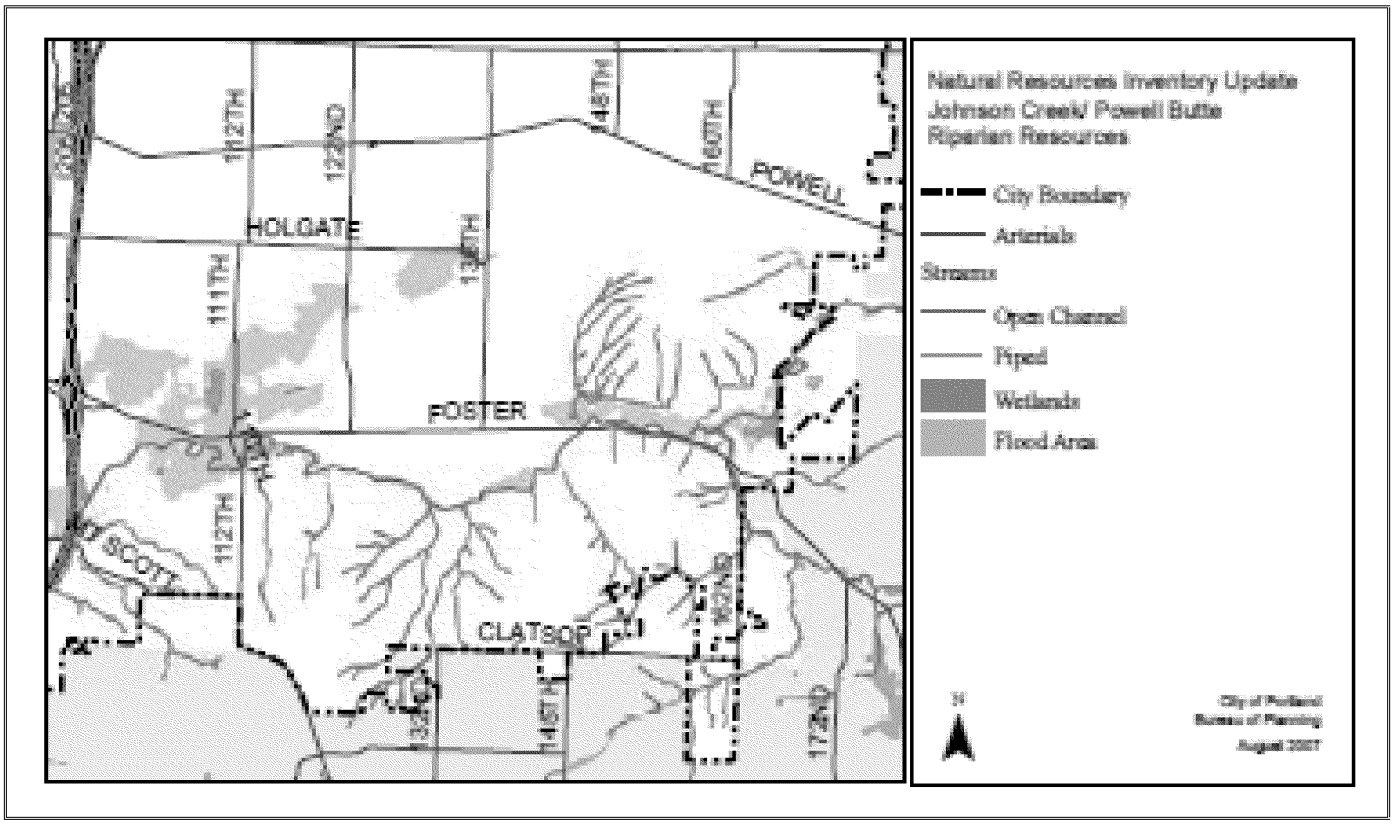
EXAMPLE (based on Fanno and Tryon Creeks Watershed Management Plan, Chapter 22 Tryon Creek Watershed Strategies and Actions, by City of Portland, Bureau of Environmental Services, 2005):



EXAMPLE (based on Fanno and Tryon Creeks Watershed Management Plan, Chapter 22 Tryon Creek Watershed Strategies and Actions, by City of Portland, Bureau of Environmental Services, 2005):



D. CAUSES AND SOURCES OR GROUPS OF SIMILAR SOURCES THAT NEED TO BE CONTROLLED TO ACHIEVE THE WATER QUALITY STANDARDS (*OAR 340-042-0040 (4) (b) to (h) and OAR 340-042-0080 (3) (a) (E) and EPA's Key Watershed Planning Components with Nine Key NPS Elements)*

1. Break Down the Sources to the Subcategory Level
2. Estimate the Pollutant Loads Entering the Waterbody

What information should be provided?
List of waterbodies within or near the DMA's jurisdiction that may be affected by activities within the jurisdiction, including waterbodies receiving runoff from the jurisdiction. List of TMDL pollutant(s) and potential source(s) that are under the DMA's jurisdiction, including a description of why these pollutants are of concern. In addition, provide an estimate of the pollutant loads by TMDL listed pollutant(s) entering the waterbodies.

Why should this be included?
Including this information in the plan will help to explain the selection of management strategies and prioritization of these strategies.

Where can this information be found?
This information can be drawn from the TMDL WQMP and other assessments of water quality resources for the area in question. The WQMP will list the specific pollutants that need to be addressed, potential sources of those pollutants, and the pollutant loads by TMDL listed pollutant(s). However, the list of sources may not cover all source categories that fall within the DMA's jurisdiction therefore, it is important to assess whether other sources are likely to exist.

Curb Cut-outs With Grass Swale

EXAMPLE (based on the Willamette TMDL WQMP):
http://www.deq.state.or.us/wq/tmdls/willamette.htm:

Water Quality Limited 303(d) Listings Addressed by TMDLs

The Coast Fork of the Willamette River is currently listed by DEQ as water quality limited due to elevated summer temperatures, elevated bacteria levels, and mercury. The watersheds are drained by X, Y, and Z. City stormwater drains to all these waterbodies and the wastewater treatment plant discharges to X. The table below identifies waterbodies within or near the [name of DMA] that may be affected by activities within the [name of DMA]'s jurisdiction, and also indicates the river miles affected, the TMDL parameter, and the season affected by the listing.

Subbasin	Waterbody Name	River Miles	Parameter	Season
Coast Fork	Coast Fork Willamette R.	0 to 31.3	Temperature	Summer
Coast Fork	Coast Fork Willamette R.	0 to 31.3	Fecal Coliform	W/S/F
Coast Fork	Coast Fork Willamette R.	0 to 31.3	Fecal Coliform	Summer
Coast Fork	Coast Fork Willamette R.	0 to 31.3	Mercury	All year

TMDL Pollutants and Potential Sources of Pollutants within [name of DMA's] Jurisdiction

TMDL pollutants in the vicinity of [name of DMA]'s jurisdiction as well as the primary suspected sources of the pollutants are:

• *Warmer Instream Temperatures - Caused by historic removal of shade-producing vegetation along streams.*

• *Fecal Coliform - Likely sources include domestic animal waste carried in stormwater runoff and illicit cross connections between sanitary and wastewater systems.*

• *Mercury - Found in sediments; likely source is erosion from construction sites not covered by DEQ permit (i.e., sites with disturbed ground surface area of less than 1 acre).*

Concerns Associated with Pollutants:

• *Temperature - At times, the Willamette River and its tributaries are too warm to*

support healthy salmon and trout. Some of these cold-water fish including lower Columbia Coho, spring Chinook, winter steelhead, and bull trout are threatened with extinction and elevated stream temperatures have contributed to their decline. Warm water interferes with adult salmon and trout migration and spawning. Warm water also decreases chances of juvenile survival, affects egg and embryo development, alters juvenile fish growth rates, and decreases their ability to compete with temperature-tolerant fish species for habitat and food. Salmon and trout are also more susceptible to disease when water temperatures are warmest.

• *Bacteria - People can be affected by bacteria present in water when enjoying water activities such as swimming, wading, wind surfing, water skiing, boating, or fishing. Ingestion or contact with water contaminated with bacteria can cause skin and respiratory ailments, gastroenteritis and other illnesses in humans.*

• *Mercury - The accumulation of mercury in fish is a well-recognized environmental problem throughout the United States. Mercury is a potent toxin that can cause damage to the brain and nervous system. Small children and the developing fetus are most sensitive to mercury's toxic effects. The primary way that humans are exposed to mercury is through the consumption of fish or seafood containing elevated levels of*

mercury.

E. POLLUTANT LOAD REDUCTIONS NEEDED TO MEET THE WATER QUALITY GOALS (*OAR 340-042-0040 (4) (l) (C) and OAR 340-042-0080 (3) (a) (E) and EPA's Key Watershed Planning Components with Nine Key NPS Elements)*

What information should be provided?
Identify the specific pollutant loads reductions by pollutant and source needed to meet the TMDL LAs and WLAs, if applicable.

Why should this be included?
Including this information in the plan will help to explain the selection of management strategies and prioritization of these strategies.

Where can this information be found?
This information can be drawn from the TMDL WQMP. The WQMP will provide the pollutant loads reduction needed by TMDL listed pollutant(s) and source(s) and the estimated pollutant load reduction by recommended most effective and other recommended BPMs in order to meet the TMDL load allocations. Refer to **Appendix I and J** for a complete list of programmatic and structural most effective and other recommended BMPs. It is recommended that the DMA select both the type and number of BMPs to be implemented within its jurisdiction in order to equal the TMDL pollutant load.

The following example simple equation for TSS pollutant represents the task:

XX Pounds of TSS [Equals] XX Pounds/Linear Foot [Times] XX Number of BMPs

(TSS Load Allocation) = (Load Reduction Est. per BMP) X (Number of Needed BMPs)

EXAMPLE (based on the Willamette TMDL WQMP):

Pollutant Load Reductions Needed To Meet LAs and WLAs

*The Coast Fork of the Willamette River is currently listed by DEQ as water quality limited due to elevated summer temperatures and elevated bacteria levels. The watersheds are drained by X, Y, and Z. City stormwater drains to all these waterbodies. The table below identifies Load Reductions estimated by Pollutant for the selected BMPs within the [name of DMA]'s jurisdiction in order to meet the TMDL load allocations. (*Note: This is just an example. The DMA is recommended to include all TMDL pollutants and BMPs needed in this section and table.)

Pollutant	BMP	Load Reduction
Temperature (Percent Effective Shade Target Surrogate)	Riparian Protection Ordinance w/ XXX Foot Buffer Width	XX Percent Effective Shade
TSS	Grassed Swales	XX Pounds Per Linear Foot
Sediment (TSS)	Street Sweeping	XX Pounds Per Curb Mile
Bacteria	Onsite System Repair or Replacement	XX E. Coli Organisms Per 100 Milliliters (MPN)
Bacteria	Infiltration Basin Facility	XX E. Coli Organisms Per 100 Milliliters (MPN)

Encourag e Dogs to Bark to Keep Waterfowl Away to Reduce Bacteria

F. MANAGEMENT STRATEGIES TO ACHIEVE LOAD ALLOCATIONS (*OAR 340-042-0040 (4) (l) (C) and OAR 340-042-0080 (3) (a) (A), EPA's Key Watershed Planning Components, with Nine Key NPS Elements, and EPA NPDES Phase I and II Stormwater Rules*)

DEQ's TMDL Rule requires DMAs to identify the management strategies the DMA or other responsible person will use to achieve load allocations and reduce pollutant loading. This section of the TMDL Implementation Plan must indicate how the urban and rural residential DMA will reduce pollution in order to address load allocations.

These management measures are for urban and rural residential activities that occur within urban areas as defined by the Oregon Land Conservation and Development Commission (LCDC) and is used by DEQ to define an Urban and Rural DMA:

LCDC Goal 14 Urban Areas Definition

5. Lands within an "Acknowledged Urban Growth Boundary".
6. Lands within an Unincorporated Community established pursuant to OAR Chapter 660, Division 022.
7. Land in a Destination Resort established pursuant to Statewide Planning Goal 8, Recreational Needs.
8. Land planned and zoned primarily for Rural Industrial or Commercial Use.

LCDC Rural Residential Areas Definition

2. Lands Planned and Zoned Primarily for Rural Residential Uses and for which an exception to Statewide Planning Goal 3, (Agricultural Lands), Goal 4 (Forest Lands), or both was acknowledged before January 1, 2000.

This includes the following:

- Identify the Selected Most Effective and Other Recommended BMPs by Pollutant
- Identify Critical Areas in Which Management Measures Are Needed

1. Identify the Selected Most Effective and Other Recommended BMPs by Pollutant

What information should be provided?
Identify the selected most effective and other recommended BMPs by pollutant and source. This will also need to include a description of how the DMA will manage the known or suspected sources of pollution. *Note:* The DMA is not responsible for pollution arising from activities that occur outside of the DMA's jurisdiction.

In some instances, it may be necessary to prioritize among the strategies if resources are limited. This may mean addressing some sources of pollution before others or focusing implementation efforts in a particular geographic area. To the extent possible, the selection of priorities should be driven by the greatest opportunities for achieving

pollutant reductions.

Why should this be included?
Including this information in the plan will help to explain the selection of management strategies needed to meet the TMDL LAs and WLAs, if applicable.

Where can this information be found?
The WQMP will list the specific most effective and other recommended BMPs by pollutant and source. In **Appendix I** DEQ has provided the recommended programmatic BMPs by TMDL listed pollutant and source and in **Appendix J** the structural BMPs by TMDL listed pollutant, source, estimated load reduction, costs, and what is included in the costs. **Appendix K** identifies those structural BMPs that are or not also Underground Injection Controls (UICs). The recommended structural BMPs generally are not UICs.

The selection of these recommended programmatic and structural BMPs is based on EPA and other technical sources that are identified in the tables. These are the most cost effective in reducing pollutant loads to meet the TMDL LAS and WLAs. These tables are designed for a DMA to easily identify for their local community the source or condition causing the TMDL listed pollutant and the programmatic and structural BMPs that are effective in controlling or treating it.

For small and medium sized communities this table is designed to be used as a toolbox to easily select those management measures that the city or county DMA does not already have available or in use. The aim is that this list of management measures be used by current city or county planning and public works staff without having to hire consultants or additional staff.

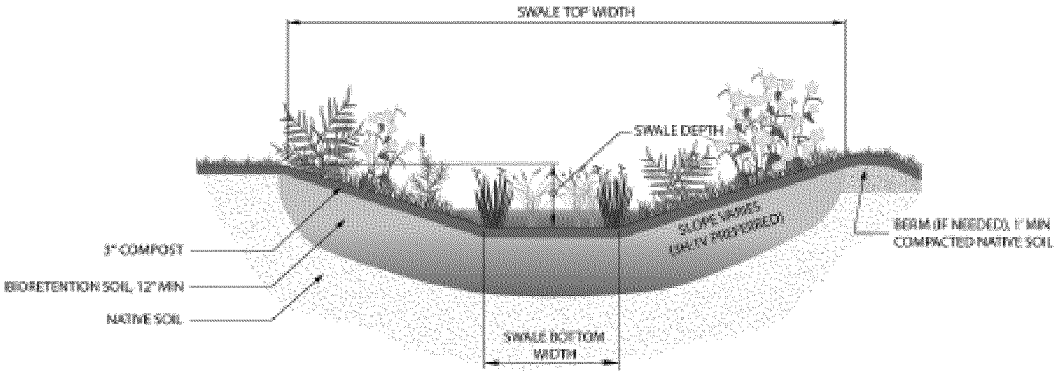
The management measures in the table were selected based on DEQ's current knowledge and available scientific studies as to the effectiveness of the proposed programmatic and technical BMPs in controlling and/or treating a source of a TMDL listed pollutant. Both the research and application of these BMPs is constantly changing as new BMPs are developed and tested on the ground. DEQ staff is committed to providing to local communities the best available science.

Many of DEQ's recommended Programmatic and Structural BMPs are also defined by EPA as Low Impact Development (LID).

a. Recommended Most Effective and Other Recommended Cost Effective Programmatic and Structural BMPs

Using the data from **Appendix I and J**, DEQ has summarized the recommended most effective and other recommended cost effective Programmatic and Structural BMPs list for urban and rural residential DMAs as outlined in **Table 6**:

Example Structural BMP: Bio-Swale



BIORETENTION SWALE

Source: Guidance for Federal Land Management in the Chesapeake Bay Watershed, EPA 841-R-10-002, May 12, 2010 http://www.epa.gov/owow_keep/NPS/chesbay502/

Table 6. DEQ Recommended Most Effective and Other Cost Effective Programmatic and Structural BMPs List

DEQ RECOMMENDED BMPS FOR URBAN AND RURAL RESIDENTIAL DMAS BY POLLUTANT				
CZARA MEASURE AND TMDL LISTED POLLUTANT	PROGRAMMTIC BMPS		STRUCTURAL BMPS	
	MOST EFFECTIVE	OTHER RECOMMENDED	MOST EFFECTIVE	OTHER RECOMMENDED
HYDROLOGY (Pre-Development)	Low Impact Development (LID) Ordinance	Stormwater Management Plan	Construction Runoff Control/Treatment Facilities	Riparian Restoration
	Stormwater Management Ordinance	Tree Protection Ordinance	Stormwater Vegetated Infiltration Basins	Tree Planting
	Riparian Protection Ordinance		Grassed Swales	
	Wetland Protection Ordinance		Stormwater Wetlands	
SEDIMENTATION (Turbidity)	Erosion and Sediment Control Ordinance	Riparian Protection Ordinance	Construction Runoff Control/Treatment Facilities	Riparian Restoration
	Low Impact Development (LID) Ordinance	Hillside Development (Steep Slopes) Protection Ordinance	Street Sweeping	Erosion Control BMPs
	Stormwater Management Ordinance	Floodway and Floodplain Overlay District Ordinance	Grassed Lined Swales	Stormwater Control/Treatment Facilities

				Stormwater Wetland

Table 6. DEQ Recommended Most Effective and Other Cost Effective Programmatic and Structural BMPs List (Cont.)

DEQ RECOMMENDED BMPS FOR URBAN AND RURAL RESIDENTIAL DMAS BY POLLUTANT				
CZARA MEASURE AND TMDL LISTED POLLUTANT	PROGRAMMTIC BMPS		STRUCTURAL BMPS	
	MOST EFFECTIVE	OTHER RECOMMENDED	MOST EFFECTIVE	OTHER RECOMMENDED
SEDIMENTATION (Turbidity) (cont.)				Porous Concrete and/or Asphalt Roads
AQUATIC WEEDS OR ALGAE (Chlorophyll a)	Erosion and Sediment Control Ordinance	Protecting Surface Water Sources of Drinking Water Ordinance	Pond/Wetland System	Street Sweeping
	Low Impact Development (LID) Ordinance	Protecting Groundwater Sources of Drinking Water Ordinance	Dry Swale	Erosion Control BMPs
		Public Areas Fertilization Policy		
BACTERIA (E coli and Fecal Coliform)	Onsite Inspection and Maintenance Ordinance	Riparian Protection Ordinance	Stormwater Control/Treatment Facilities	Riparian Restoration
	Local Community Loan Program	No Wildlife Feeding Ordinance	Onsite Systems Repair or Replacement	Dog Run Parks
	Low Impact Development Ordinance	Illicit Discharge and Connection Ordinance		

Table 6. DEQ Recommended Most Effective and Other Cost Effective Programmatic and Structural BMPs List (Cont.)

DEQ RECOMMENDED BMPS FOR URBAN AND RURAL RESIDENTIAL DMAS BY POLLUTANT				
CZARA MEASURE AND TMDL LISTED POLLUTANT	PROGRAMMTIC BMPS		STRUCTURAL BMPS	
	MOST EFFECTIVE	OTHER RECOMMENDED	MOST EFFECTIVE	OTHER RECOMMENDED
BACTERIA (E coli and Fecal Coliform) (Cont.)	Pet Waste Pick-Up Ordinance			
DISSOLVED OXYGEN	Same Programmatic BMPs Listed Below For Nutrients (Nitrates and Phosphorus)	Same Programmatic BMPs Listed Below For Nutrients (Nitrates and Phosphorus)	Same Programmatic BMPs Listed Below For Nutrients (Nitrates and Phosphorus)	Same Programmatic BMPs Listed Below For Nutrients (Nitrates and Phosphorus)
NUTRIENTS (Nitrates and Phosphorus)	Erosion and Sediment Control Ordinance	Protecting Surface Water Sources of Drinking Water Ordinance	Pond/Wetland System	Street Sweeping
	Low Impact Development (LID) Ordinance	Protecting Groundwater Sources of Drinking Water Ordinance	Dry Swale	Erosion Control BMPs
		Public Areas Fertilization Policy		

Table 6. DEQ Recommended Most Effective and Other Cost Effective Programmatic and Structural BMPs List (Cont.)

DEQ RECOMMENDED BMPS FOR URBAN AND RURAL RESIDENTIAL DMAS BY POLLUTANT				
CZARA MEASURE AND TMDL LISTED POLLUTANT	PROGRAMMTIC BMPS		STRUCTURAL BMPS	
	MOST EFFECTIVE	OTHER RECOMMENDED	MOST EFFECTIVE	OTHER RECOMMENDED
TEMPERATURE	Riparian Protection Ordinance	Stormwater Management Ordinance	Riparian Restoration	Instream Restoration
	Wetland Protection Ordinance	Instream Flow Purchased	Stormwater Wetlands	Stormwater Vegetated Infiltration Basins
		Stormwater Management Plan		Grassed Swales
		Tree Protection Ordinance		Tree Planting
TOXICS (Attached to Sediments)	Same Programmatic BMPs Listed Above For Sedimentation (Turbidity)	Same Programmatic BMPs Listed Above For Sedimentation (Turbidity)	Same Structural BMPs Listed Above For Sedimentation (Turbidity)	Same Structural BMPs Listed Above For Sedimentation (Turbidity)
TOXICS (In Water)	Integrated Pest Management Ordinance (IPM) Ordinance	Same Programmatic BMPs Listed Above For Nutrients (Nitrates and Phosphorus)	Same Structural BMPs Listed Above For Nutrients (Nitrates and Phosphorus)	Same Structural BMPs Listed Above For Nutrients (Nitrates and Phosphorus)
	Same Programmatic BMPs Listed Above For Nutrients (Nitrates and Phosphorus)	Same Programmatic BMPs Listed Above For Nutrients (Nitrates and Phosphorus)	Same Structural BMPs Listed Above For Nutrients (Nitrates and Phosphorus)	Same Structural BMPs Listed Above For Nutrients (Nitrates and Phosphorus)

b. Programmatic BMPs

Many of the most effective and other recommended programmatic BMPs involve the adoption of ordinances that protect sensitive environmental areas, the prevention of pollutants entering waters of the state (e.g. erosion and sediment control), or require infiltration and/or treatment of runoff.

These include the following ordinances:

- Riparian Protection
- Wetland Protection
- Hillside Protection
- Tree Protection
- Floodway and Floodplain
- Drinking Water Protection (Surface and Groundwater Sources)
- Low Impact Development
- Stormwater Management
- Illicit Discharge and Connection
- Erosion and Sediment Control
- Onsite Inspection and Maintenance
- Pet Waste Pick-Up
- No Wildlife Feeding

Example ordinances are identified in **Appendix I,** Programmatic BMPs tables and in **Appendix J,** Structural BMPs tables.

Riparian Protection Ordinance

An important Programmatic BMP is the adoption of a Riparian Protection Ordinance. One of the decisions recommended in developing the ordinance is the riparian buffer on each side of a waterbody. The Implementation Ready TMDL WQMP will identify the riparian buffer widths of the 303(d) listed waterbody needed to meet temperature TMDLs. **Appendix L** contains an example riparian buffer widths determination figure. The buffer widths for various temperature TMDL surrogate percent effective shade LAs are identified based on the width of a channel.

Functional riparian area buffer widths for the protection of water quality vary widely by parameter. In some instances, developments and infrastructure may be present which would prevent implementing buffer widths identified in the TMDL. DMAs are encouraged to design and implement riparian buffer scenarios that will result in the maximum practicable pollutant reductions at these sites. The DMA is recommended to quantify continued pollutant loading and seek to offset this pollutant load in other site-specific area BMPs.

c. Structural BMPs

The majority of the most effective and other recommended structural BMPs in **Appendix J** are taken directly from EPA's National Pollutant Discharge Elimination System (NPDES) Stormwater BMP website: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm or from other sources. These BMPs prevent pollutants from entering waters of the state (e.g. erosion and sediment control) or require infiltration and/or treatment of runoff.

Many structural BMPs are considered Low Impact Development (LID) or Green Infrastructure BMPs. These BMPs rely on infiltration, evaporation, and capture and/ reuse. In addition, some of the recommended structural BMPs capture and treat runoff pollutants.

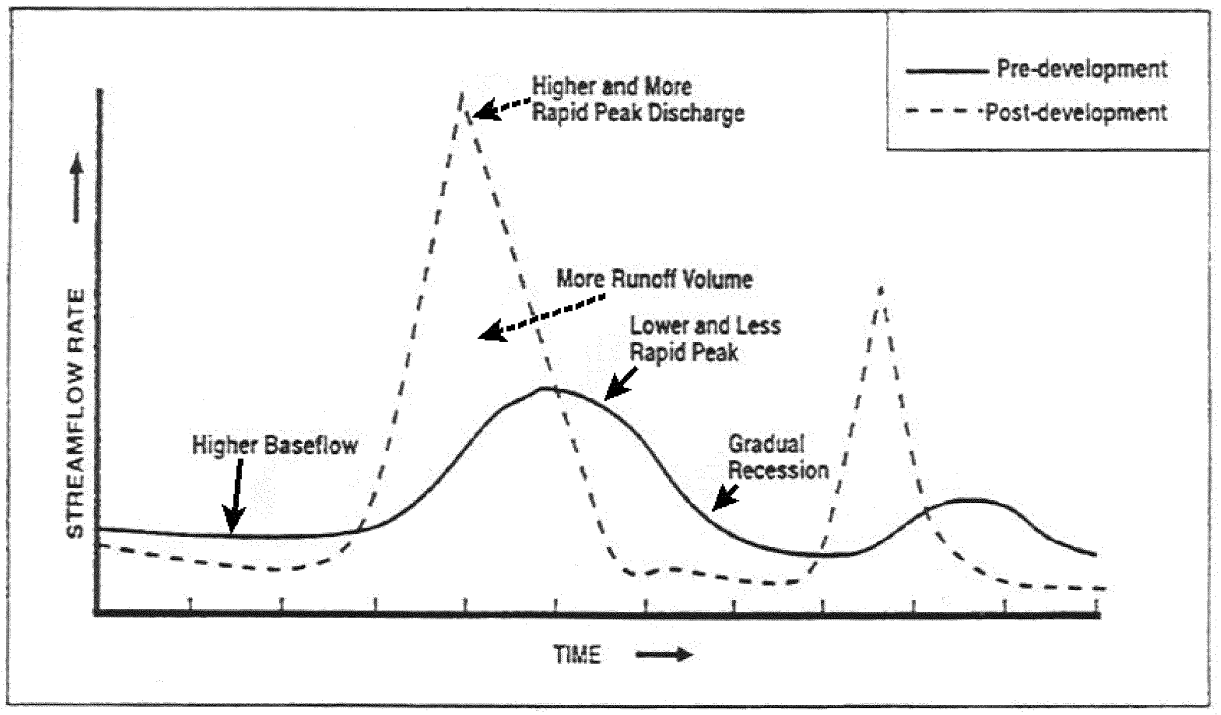
Once development occurs, the natural surface water systems are replaced by stormwater infrastructure. These once natural systems are now draining runoff from all developed/impervious areas. This runoff picks up pollutants, increases the volume of runoff, (that once infiltrated into the ground), and therefore increases unstable stream banks, and flooding.

Water Quality Is Dependent Upon Water Quantity Equaling Pre-Development Hydrology

Urban development increases the peak discharge rate associated with a given design storm because impervious surfaces generate greater runoff volumes and drainage systems deliver it more rapidly to a stream. **Figure 7** profiles the change in the receiving water due to post-development peak discharge rates that accompany development.

Stream Displaying the Effects of Stormwater Runoff and Channel Down Cutting

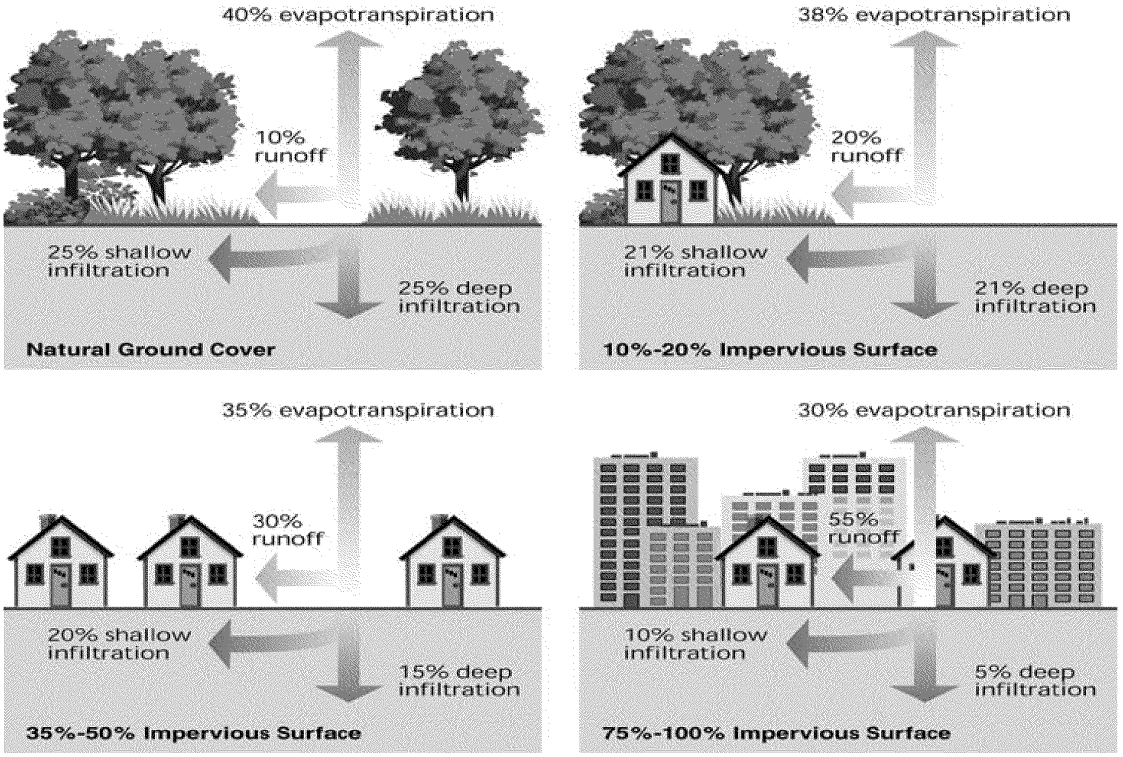
Figure 7. Pre- and Post-Development Peak Discharge Rates



Source: Maryland Department of the Environment (MDE), 2000, Maryland Stormwater Design Manual: Volume 1 and 2, Maryland Department of the Environment, Annapolis, Maryland.
http://www.mde.state.md.us/assets/document/sedimentstormwater/Introduction.pdf

Moreover, **Figure 8** identifies the impacts of various development intensity, expressed as impervious surfaces percent, on the hydrology of urban areas.

Figure 8. Impact of Impervious Surfaces Percent on Urban Areas Runoff



Source: EPA Stormwater Best Management Practice Design Guide: Volume 1, General Considerations, EPA/600/R-04/121, September 2004 http://www.epa.gov/nrmrl/pubs/600r04121/600r04121.pdf

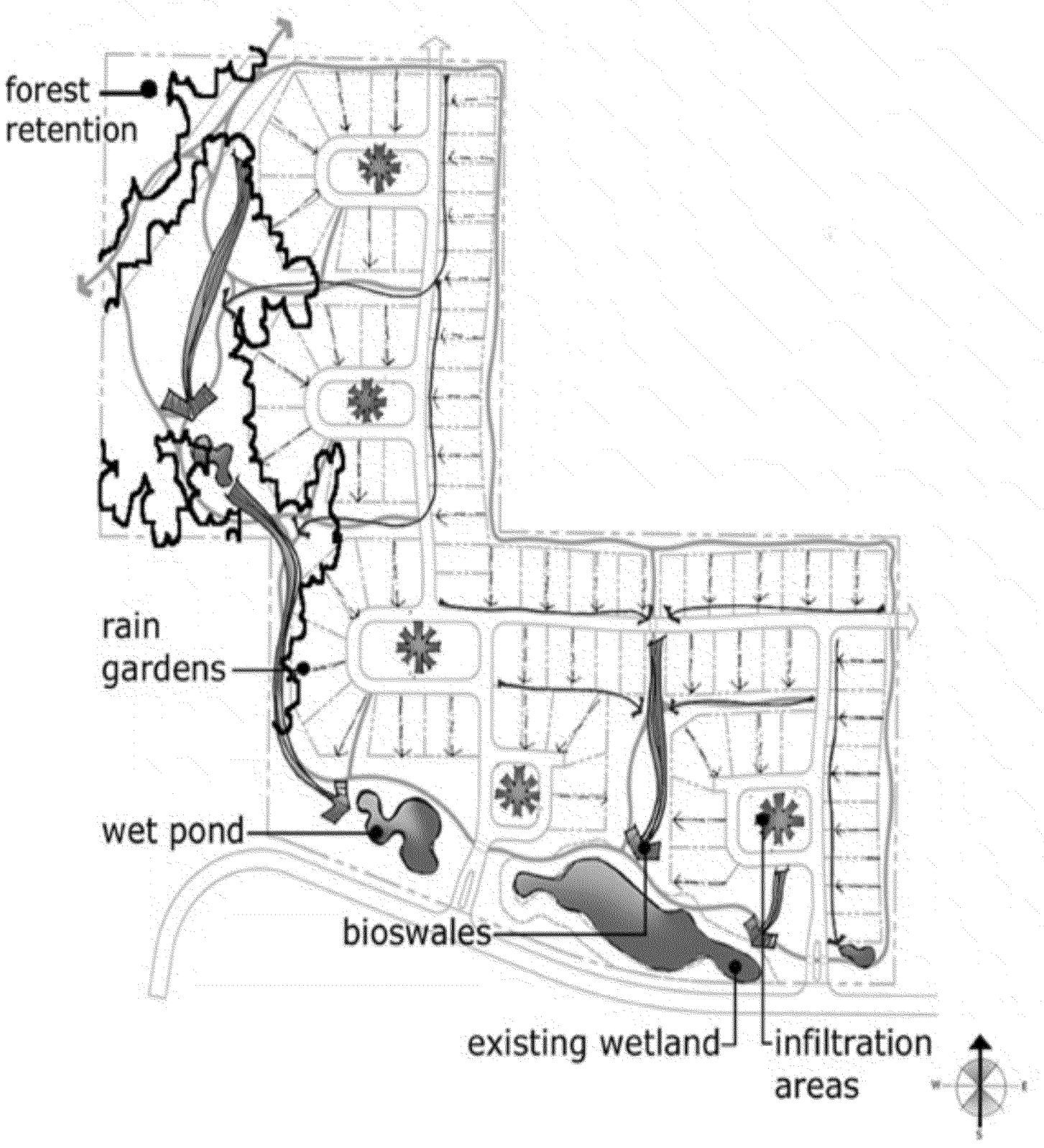
Low Impact Development

The BMPs selected for inclusion by the DMA in the TMDL Implementation Plan is recommended to emphasize replicating pre-development hydrology with respect to runoff volume, temperature, rate, and duration as a more reliable and effective stormwater management practice than traditional approaches that focus on pollutants without addressing hydrology. That emphasis is already expressed in a number of recent EPA documents and numerous states, cities, and expert groups, including the National Academy of Sciences (http://www.epa.gov/owow/NPS/lid/#guide and http://epa.gov/greeninfrastructure).

EPA defines **Low Impact Development (LID)** as *"A comprehensive stormwater management and site-design technique. Within the LID framework, the goal of any construction project is to design a hydrologically functional site that mimics predevelopment conditions. This is achieved by using design techniques that infiltrate, filter, evaporate, and store runoff close to its source. Rather than rely on costly large-scale conveyance and treatment systems, LID addresses stormwater through a variety of small, cost-effective landscape features located on-site. LID is a versatile approach that can be applied to new development, urban retrofits, and revitalization projects. This design approach incorporates strategic planning with micro-management techniques to achieve environmental protection goals while still allowing for development or infrastructure rehabilitation to occur."*

LID BMP That Incorporates Decentralized Stormwater Management Features in Villebois Development In Wilsonville, Oregon

Pierce County, Washington LID/Green Infrastructure Design



Selecting BMPs for Multiple Pollutants

An important note in the use of these tables in developing a TMDL Implementation Plan is that many waterbodies within a city or county only have a few of the pollutants on the 303(d) list and have TMDLs developed by DEQ. However, based on many local, regional, and national water quality studies, most communities will have many if not all of these pollutants in their waterbodies that do not meet water quality standards.

Over time, most likely DEQ will include more of the urban pollutants, not just temperature and bacteria, in TMDLs that will require urban and rural residential DMAs to develop implementation plans with BMPs that control and treat these pollutants. DEQ recommends that urban and rural residential DMAs prepare a comprehensive implementation plan that includes BMPs for all possible sources and pollutants.

This is particularly applicable for the larger and medium sized communities or those that have a major highway running through their community, have a number of industrial or commercial land uses, or have other suspected or known nonpoint sources that would contribute many of the urban related pollutants. This includes both sediment and water-laden pollutants identified in the **Appendix I and J** BMPs tables.

An early example is DEQ's first TMDL for the total phosphorus pollutant in the Tualatin River Basin. The most cost effective BMP was to install sediment basins. However, the water that was discharged to the nearby waterbodies exceeded the state's temperature standard. This was due to the lack of shading and/or treatment through a wetland-treed pond that would cool down the return water.

Best Management Practices "Treatment Train" Concept

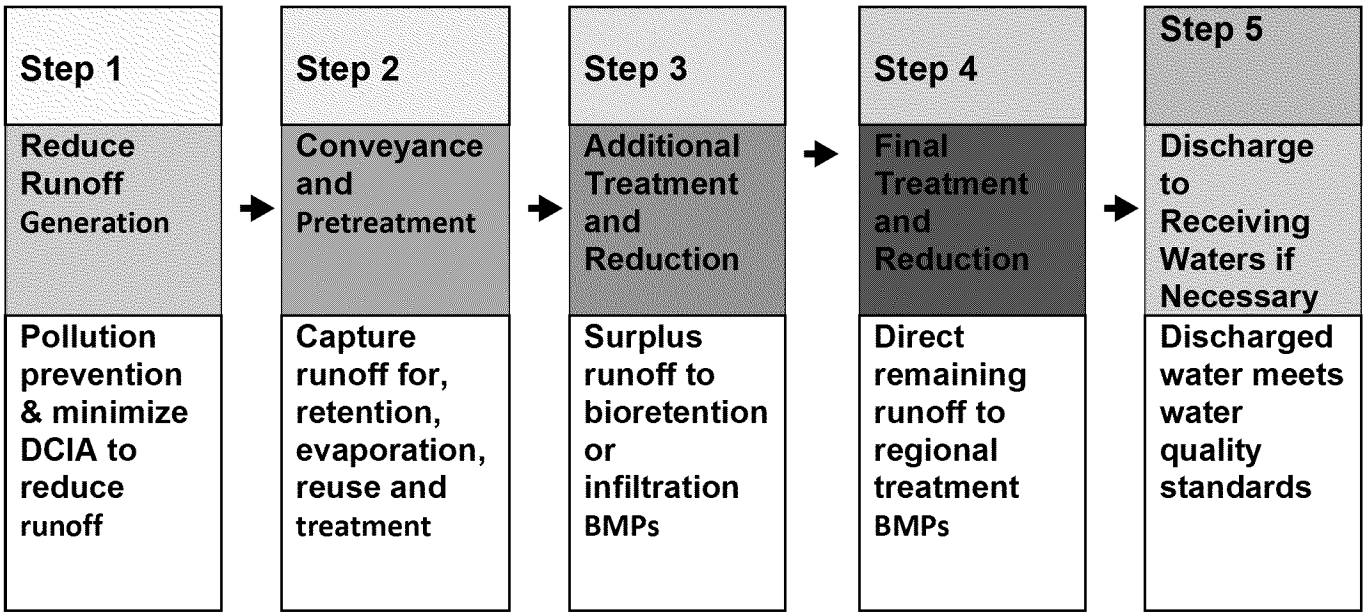
Projects are most successful when LID practices and BMPs are integrated into a site design and are used in a "treatment train" approach. In such an approach, the overflow from one practice flows into a second or third practice, such as a green roof followed by a cistern, with the overflow to a planter box with its own overflow and under drain. Site conditions, applicable performance requirements, and cost typically influence the selection of appropriate LID practices.

Stormwater treatment via multiple, consecutive BMPs can significantly improve the quality of water discharged to urban rivers, lakes, streams, wetlands, and coastal waters. In general, stormwater treatment trains should seek to address source controls and infiltration, evapotranspiration and reuse first, then large particles, and, finally, small particles. The specific pollutant removal role of the second or third facility in a treatment train often assumes that significant settling or removal of solids has already occurred.

For example, phosphorus removal using a two-facility treatment sequence relies on the second facility (e.g., sand filter) to remove a finer fraction of solids than those removed by the first facility. It is recommended that oil control facilities be upstream of treatment facilities and as close to the source of oil-generating activities as possible. They should also be upstream of detention facilities, if possible. However, not all treatment facilities can function effectively if located downstream of detention facilities. Those facilities that treat unconcentrated sheet flows, such as filter strips and narrow biofilters, are usually not practical downstream of detention facilities because of a variety of factors, including the sheer volume that may need to be treated.

This is important given that many BMPs are only effective for a selected number of pollutants. In the end, a city or county will find it more cost effective and efficient to construct multiple BMPs in what is called a "treatment train" as outlined in **Figure 9.**

Figure 9. Best Management Practices "Treatment Train" Concept

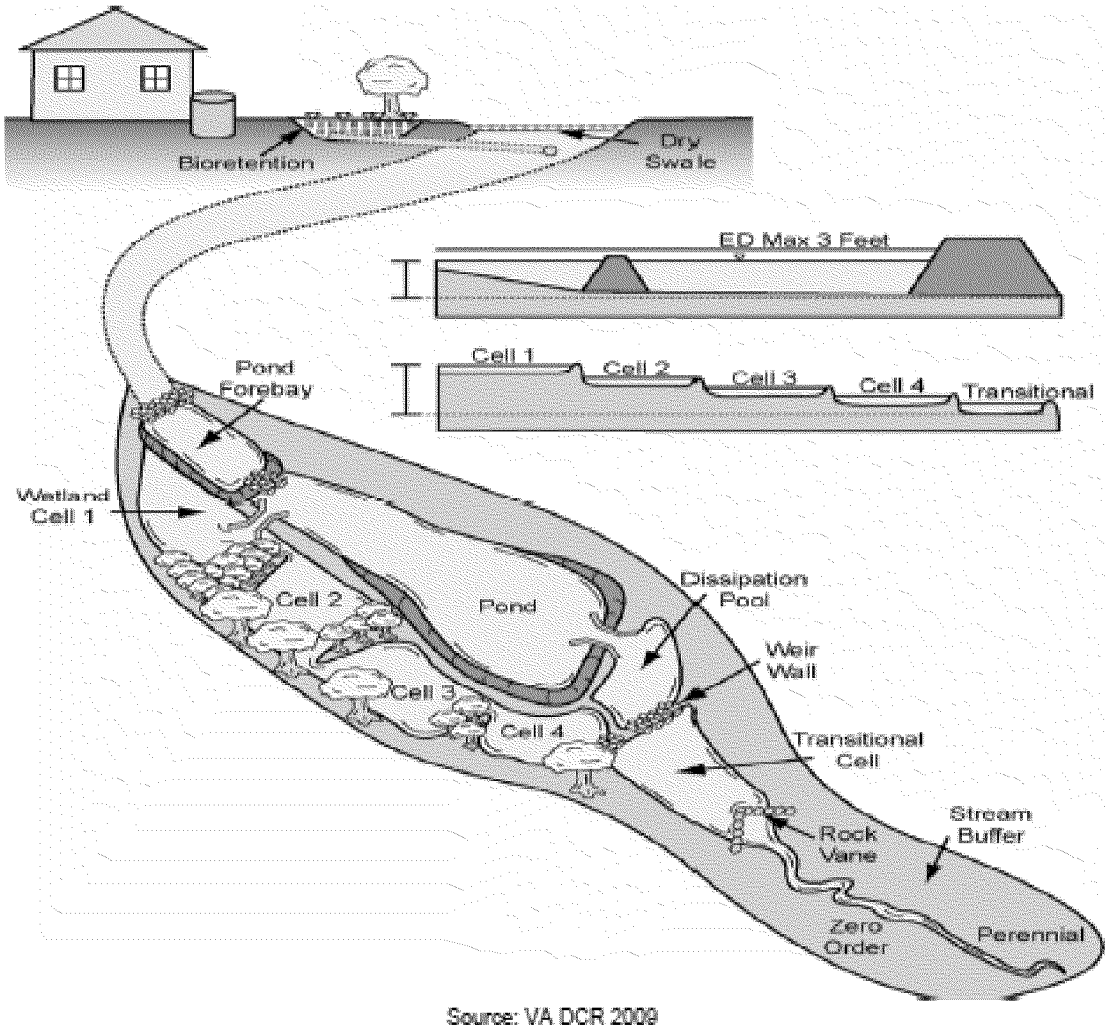


Notes:
1. DCIA is directly connected impervious area.
2. Recharge/infiltration should be attained wherever possible.
3. Multi-step treatment maximizes removal of both suspended and dissolved pollutants.

Source: As Modified - *Tertiary Treatment of Urban Stormwater,* University of Newcastle, Australia, Posted 11-12-99 by Nigel Bosworth.

The following figure is an example of a treatment train:

EXAMPLE (Based on VADCR (Virginia Department of Conservation and Recreation). 2009. Draft VA DCR Stormwater Design, Specification No. 13: Constructed Wetlands Version 1.5, July 2, 2009, http://www.vwrrc.vt.edu/swc/July2009Updates/VASWMBMPSpec13CONSTRUCTEDWETLAND.html):



Source: VA DCR 2009

Figure 3A1-24. Pond/wetland combination.

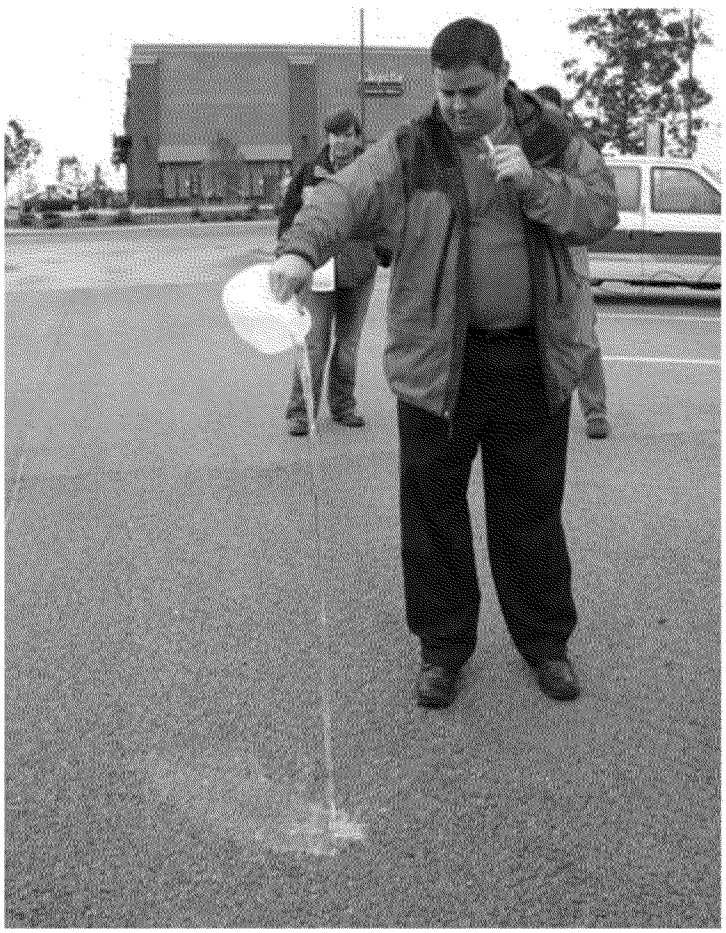
d. BMPs Implementation Map

The TMDL Implementation Plan should describe the selected most effective and other recommended programmatic and structural BMPs. DMAs are recommended to focus on identifying the most appropriate geographic location for siting and installing structural BMPs or conducting nonstructural BMPs. Factors affecting BMP siting decisions might include local conditions such as slopes, soils, and critical areas; historical, current, and future land uses; property ownership; cost; site access; infrastructure considerations; and social acceptance.

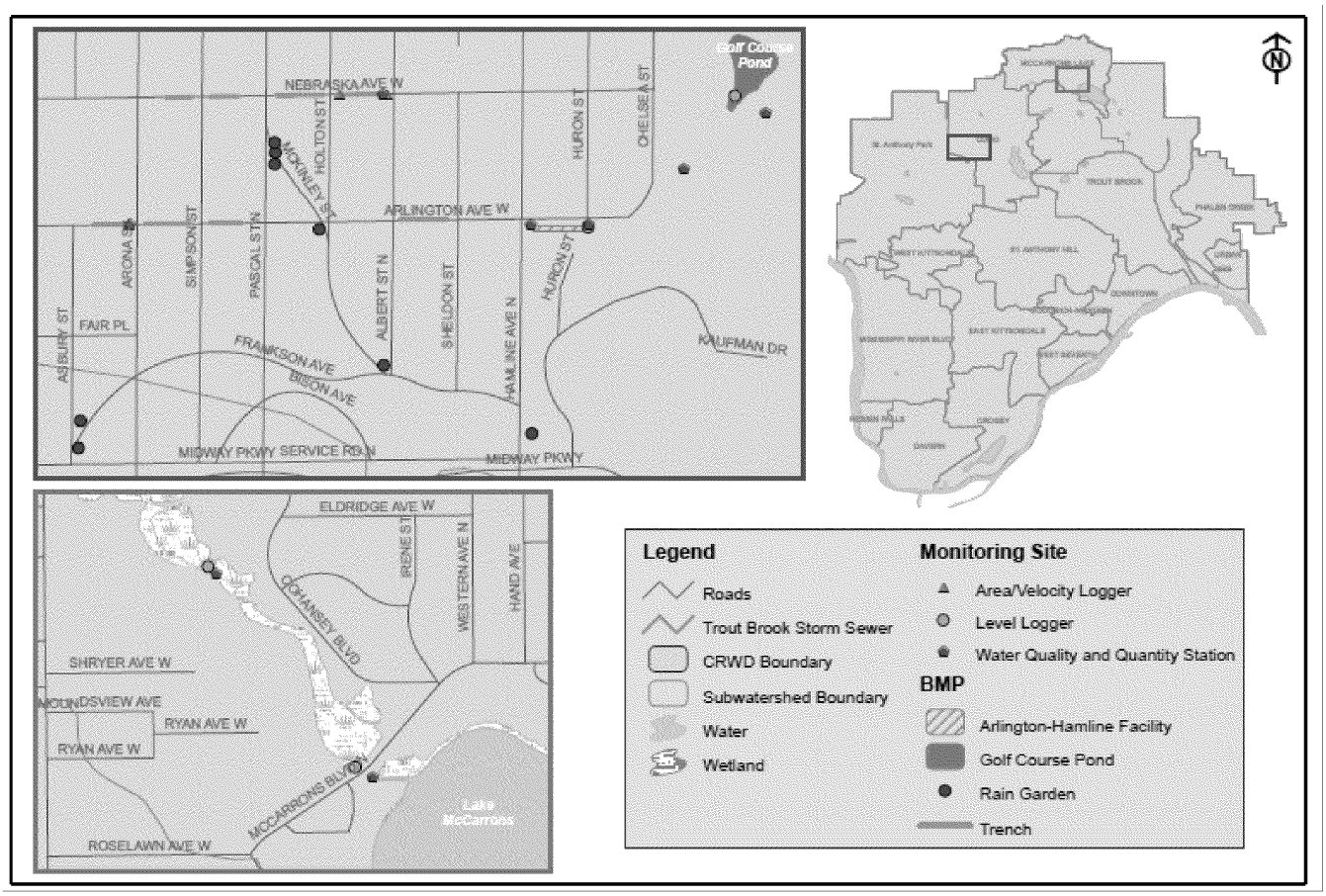
In addition, DMAs should consider recommending areas where BMPs can result in the greatest pollutant load reduction. These so-called *critical areas* are at or near pollutant source areas, and could include places with severe upland or channel erosion, sites generating oil and grease or other toxics, extensively paved sub watersheds or small catchments requiring runoff volume controls, areas with a high density of illicit connections, parks that generate significant bacteria loads from pets, industrial facilities generating high pollutant loads, and similar locations.

A map should also be included that identifies where the structural BMPs will be implemented over time. The following maps are an example:

Porous Pavement



EXAMPLE (based on Stormwater BMP Performance Assessment and Cost-Benefit Analysis, by Capitol Region Watershed District, St. Paul, MN, January 22, 2010, http://www.capitolregionwd.org/documents/BMP_Report_Main_Body_View.pdf):



ADDITIONAL EXAMPLE (based on Stormwater BMP Performance Assessment and Cost-Benefit Analysis, by Capitol Region Watershed District, St. Paul, MN, January 22, 2010, http://www.capitolregionwd.org/documents/BMP_Report_Main_Body_View.pdf):

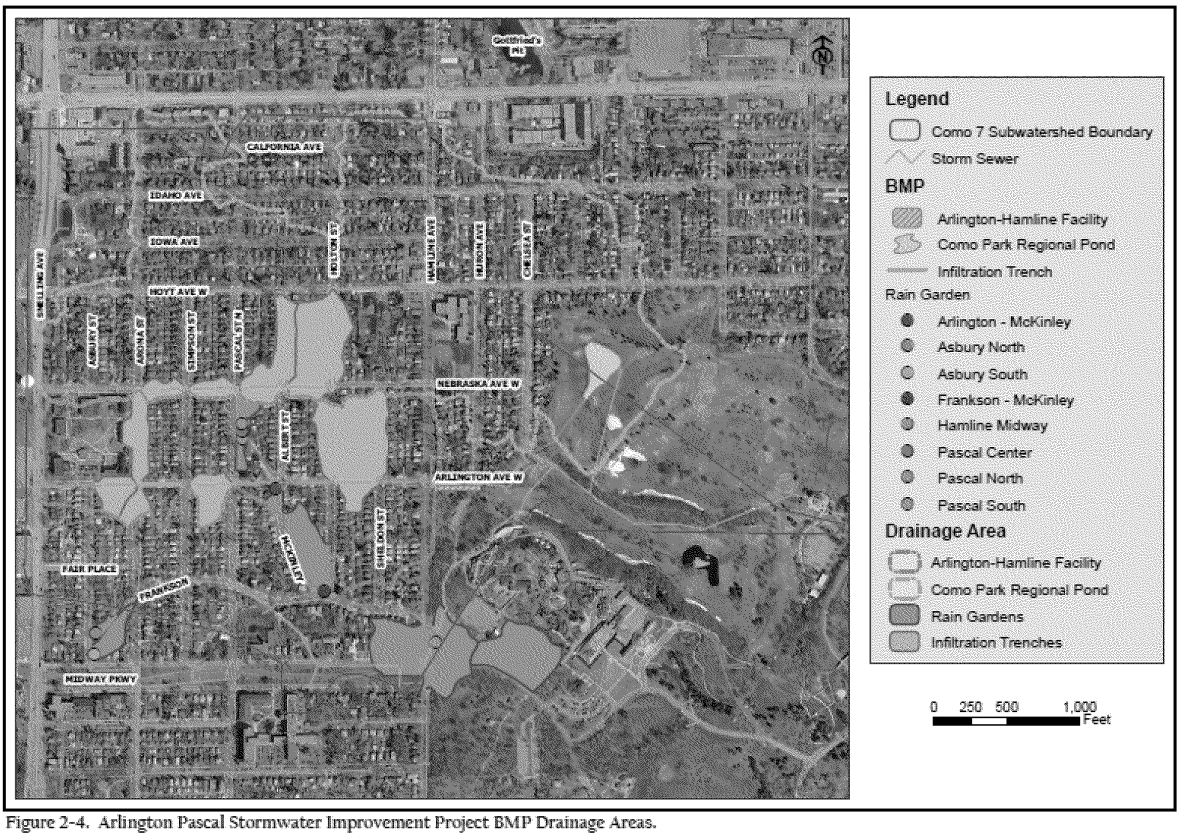


Figure 2-4. Arlington Pascal Stormwater Improvement Project BMP Drainage Areas.

ADDITIONAL EXAMPLE (based on Stormwater BMP Performance Assessment and Cost-Benefit Analysis, by Capitol Region

Watershed District, St. Paul, MN, January 22, 2010, http://www.capitolregionwd.org/documents/BMP_Report_Main_Body_View.pdf **):**

ADDITIONAL EXAMPLE (based on Fanno and Tryon Creeks Watershed Management Plan, Chapter 22 Tryon Creek

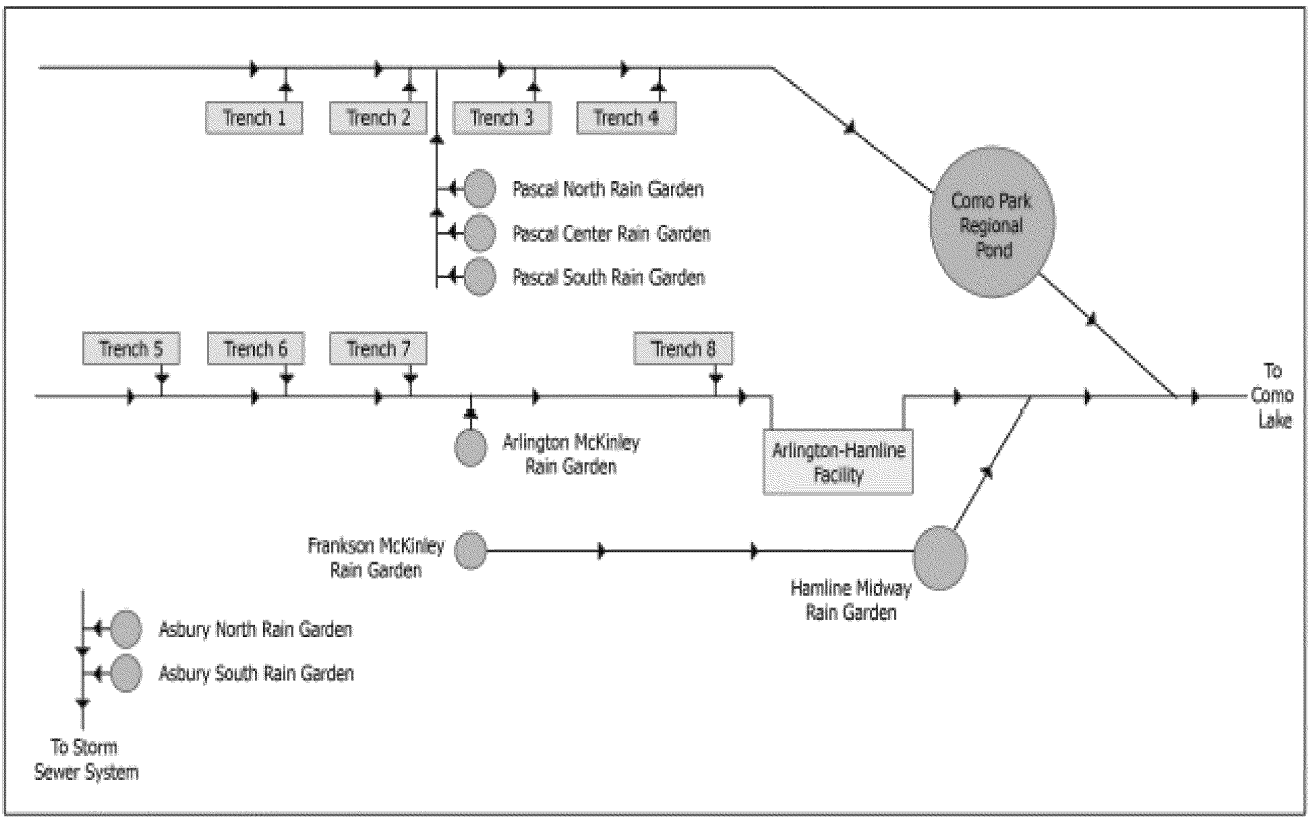
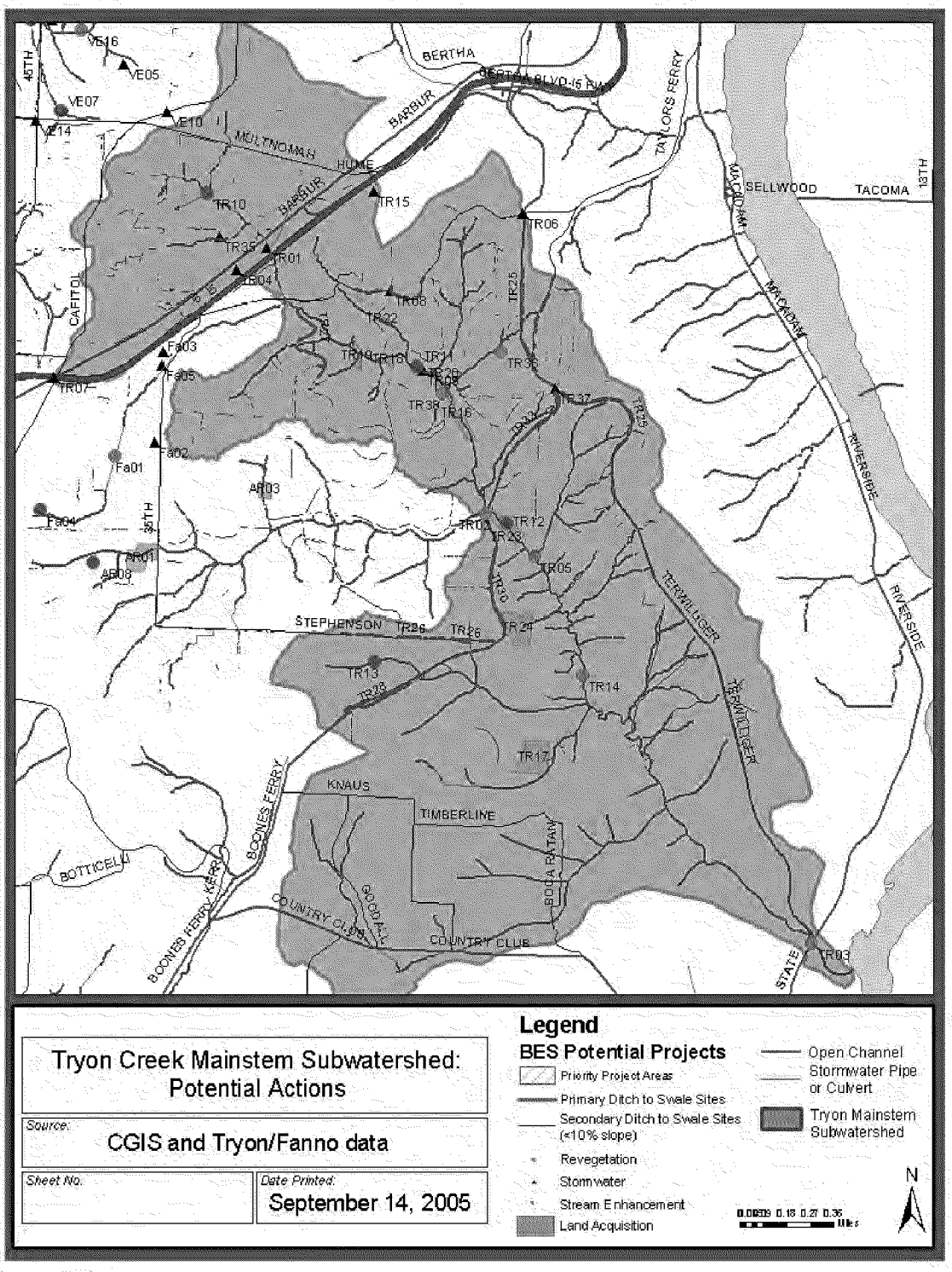


Figure 2-5. APSIP BMP Flow Network.

Watershed Strategies and Actions, by City of Portland, Bureau of Environmental Services, 2005 (http://www.portlandonline.com/bes/index.cfm?c=43097&a=128526):



EXAMPLE PROJECT BMPs List (based on Fanno and Tryon Creeks Watershed Management Plan, Chapter 22 Tryon Creek Watershed Strategies and Actions, by City of Portland, Bureau of Environmental Services, 2005 http://www.portlandonline.com/bes/index.cfm?c=43097&a=128526):

Action ID	Name	Description
TR01	I-5 and Barbur Blvd Retrofit	Stormwater: retrofit the impervious parking areas to reduce runoff and improve water quality.
TR02	Boones Ferry Rd Culvert	Aquatic restoration: retrofit the culvert to improve fish passage.
TR03	Highway 43 Culvert	Aquatic restoration: retrofit the culvert to improve fish passage.
TR04	Upper Tryon Creek Commercial Area Retrofit	Stormwater: retrofit the impervious parking areas to reduce runoff and improve water quality.
TR05	NOAA Tryon Creek Enhancement	Stream Enhancement: Improve aquatic habitat complexity and protect sanitary sewer.
TR06	Burlingame Mall Retrofit	Stormwater: retrofit the impervious parking areas to reduce runoff and improve water quality.
TR07	Capitol Hwy West Portland Center Retrofit	Stormwater: retrofit the impervious parking areas to reduce runoff and improve water quality.
TR08	17th and Taylor's Ferry Rd	Stormwater: retrofit the impervious parking areas to reduce runoff and improve water quality.
TR09	Marshall Park impervious area removal	Stormwater: retrofit the impervious parking areas to reduce runoff and improve water quality.
TR10	Windgate	Revegetation: plant trees to provide habitat, stabilize soils, and intercept rainfall.
TR11	Marshall Park South Basketball Court area	Revegetation: plant trees to provide habitat, stabilize soils, and intercept rainfall.
TR12	Boones Ferry Rd Crossing	Revegetation: plant trees to provide habitat, stabilize soils, and intercept rainfall.
TR13	Meadowview	Revegetation: plant trees to provide habitat, stabilize soils, and intercept rainfall.
TR14	Tryon Creek State Natural Area Stream Restoration	Stream Enhancement: Improve aquatic habitat complexity and protect sanitary sewer.
TR15	Capitol Hill Elementary School	Stormwater: retrofit the impervious parking areas to reduce runoff and improve water quality.
TR16	East of Marshall Park	Land Acquisition: procure land of high resource value for preservation.

CONTINUED EXAMPLE PROJECT BMPs List (based on Fanno and Tryon Creeks Watershed Management Plan, Chapter 22 Tryon Creek Watershed Strategies and Actions, by City of Portland, Bureau of Environmental Services, 2005 http://www.portlandonline.com/bes/index.cfm?c=43097&a=128526):

Action ID	Name	Description
TR17	Englewood	Land Acquisition: procure land of high resource value for preservation.
TR18	Extension Near Stream	Land Acquisition: procure land of high resource value for preservation.
TR19	Jensen Foley Connection	Land Acquisition: procure land of high resource value for preservation.
TR20	Marshall Park Connection N Maplecrest	Land Acquisition: procure land of high resource value for preservation.
TR21	Maricara Park Riparian Extension	
TR22	Marshall Park North Extension	Land Acquisition: procure land of high resource value for preservation.
TR23	Tryon Creek State Natural Area Connection	Land Acquisition: procure land of high resource value for preservation.
TR24	Tryon Life Farm	Land Acquisition: procure land of high resource value for preservation.
TR25	Along Terwilliger	Stormwater: Implement Ditch to Swale retrofits to improve water quality and public safety.
TR26	Along Stevenson	Stormwater: Implement Ditch to Swale retrofits to improve water quality and public safety.
TR27	Along Lancaster North	Stormwater: Implement Ditch to Swale retrofits to improve water quality and public safety.
TR28	Boones Ferry Rd Southwest	Stormwater: Implement Ditch to Swale retrofits to improve water quality and public safety.
TR29	Boones Ferry Rd South	Stormwater: Implement Ditch to Swale retrofits to improve water quality and public safety.
TR30	Boones Ferry Rd South 2	Stormwater: Implement Ditch to Swale retrofits to improve water quality and public safety.
TR31	Boones Ferry Rd North	Stormwater: Implement Ditch to Swale retrofits to improve water quality and public safety.
TR32	Boones Ferry Rd Mid Southwest	Stormwater: Implement Ditch to Swale retrofits to improve water quality and public safety.

CONTINUED EXAMPLE PROJECT BMPs List (based on Fanno and Tryon Creeks Watershed Management Plan, Chapter 22 Tryon Creek Watershed Strategies and Actions, by City of Portland, Bureau of Environmental Services, 2005 http://www.portlandonline.com/bes/index.cfm?c=43097&a=128526):

Action ID	Name	Description
TR33	Boones Ferry Rd Mid	Stormwater: Implement Ditch to Swale retrofits to improve water quality and public safety.
TR34	Near 17th on Taylor's Ferry Rd	Stormwater: Implement Ditch to Swale retrofits to improve water quality and public safety.
TR35	Headwaters Project	Stormwater: retrofit the impervious parking areas to reduce runoff and improve water quality.
TR36	Plum Pocket Project (SW 6th and Lucille)	Revegetation: plant trees to provide habitat, stabilize soils, and intercept rainfall.
TR37	Terwilliger and Boones Ferry Rd Intersection	Stormwater: retrofit, as part of PDOT projects, to reduce runoff and improve water quality.
TR38	Marshall Park Trails	Stream Enhancement: retrofit trail system to decrease erosive impacts to stream banks.

e. Community Stormwater Management Plan and NPDES MS4 Stormwater Permit Requirements

Many of the above example BMP Implementation Maps are similar to a Community Stormwater Management Plan (SWMP). If your community is designated as a Phase II MS4 community (such as the City of Medford) under EPA's NPDES Phase II MS4 Stormwater Rules, a SWMP may already exist. You may need to update your MS4 SWMP, Program, and associated legal documents (e.g., stormwater ordinances) to address the Waste Load Allocations (WLAs) in the TMDL. For those waterbodies that do not yet have a TMDL issued, DMAs should consult their MS4 NPDES permit to determine what intermediate steps can be taken to address those impairments.

Specifically, EPA's NPDES Phase II MS4 Stormwater Rules general permit language requires permittees to, "*include a written section in its stormwater management program [and plan] that discusses the management practices and control measures it will implement as part of its program to reduce, with the goal of eliminating, the discharge of pollutant(s) of concern that contribute to the impairment of the waterbody. This section of the permittee's program shall specifically identify control measures and practices that will collectively be used to try to eliminate the MS4's discharge of pollutant(s) of concern that contribute to the impairment of the waterbody and explain why these control measures and practices were chosen as opposed to other alternatives.*"

EXAMPLE (based on the DEQ Issued MS4 NPDES Stormwater Permit and the TMDL WQMP Requirements):

The Coast Fork of the Willamette River is currently listed by DEQ as water quality limited due to elevated bacteria levels. The watersheds are drained by X, Y, and Z. City stormwater drains to all these waterbodies.

"[Name of DMA] submits the attached MS4 NPDES Stormwater permit required SWMP that already addresses the assigned WLAs and other requirements outlined in the ***DEQ TMDL Implementation Plan Guidance.*** *[Name of DMA] states that the SWMP Covers All Stormwater Discharges"*

In situations where the DMA is not a MS4 community and the TMDL WQMP or the DMA's TMDL Implementation Plan may include the development of a Stormwater Management Plan (SWMP) as a BMP to meet the TMDL, the following guidance documents are available to assist in the preparation of a community SWMP.

Bioretention Area Treating Runoff From A Parking Lot

EXAMPLE SWMP DEVELOPMENT GUIDANCE:

San Bernardino County Stormwater Program, Model Water Quality Management Plan Guidance, Revised June 09, 2005 (http://www.waterboards.ca.gov/santaana/water_issues/programs/stormwater/docs/sbpermit/wqmpguide60905.pdf)

New Jersey Stormwater Best Management Practices Manual, APPENDIX C, Sample Municipal Stormwater Management Plan February 2004. (http://www.nj.gov/dep/stormwater/bmp_manual/NJ_SWBMP_C.pdf)

EXAMPLE SWMPS:

City of Springfield (Oregon) Stormwater Management Plan, Prepared by: City of Springfield, Public Works Environmental Services Division, January 2004. (https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/5828/Springfield_Stormwater_Master_Plan.pdf?sequence=1)

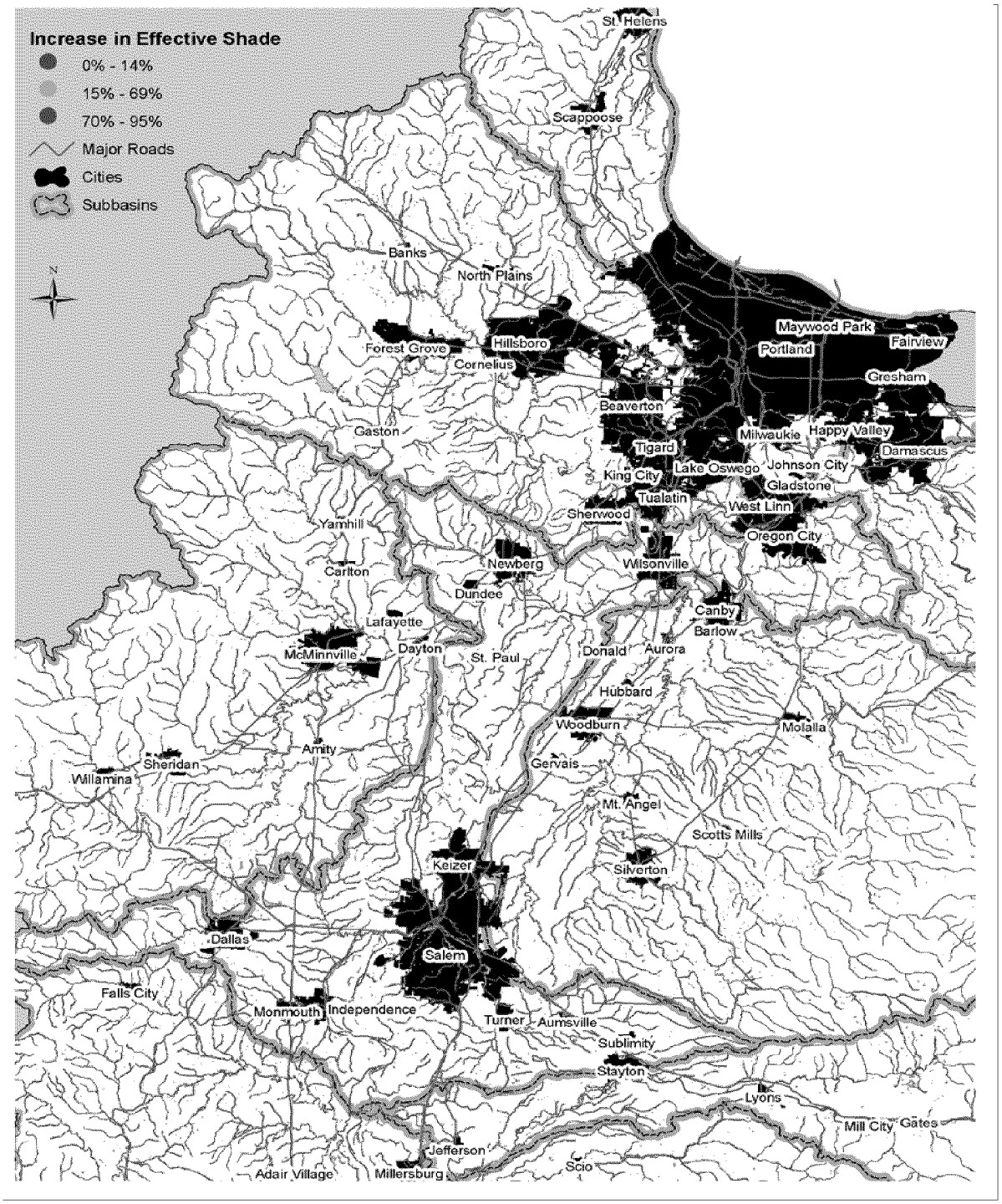
Greenville Stormwater Management Plan 2007, Prepared by City of Greenville Public Works Department, Engineering Division. (http://www.greenvillesc.gov/PublicWorks/forms/StormwaterManagementPlan/Greenville_Stormwater_Management_Plan.pdf)

2. Identify Critical Areas in Which Management Measures are Needed

The following figure identifies those critical areas in which a specific BMP is needed. This example is for constructing streamside fences to protect riparian areas from grazing or other land use activities. Other critical or environmentally sensitive areas or sites, such as wetlands, steep slopes, highly erosive soils, etc. could also need specific BMPs, including restoration.

EXAMPLE CRITICAL AREAS RIPARAIN AREAS RESTORATION MAP (based on Cost Estimate to Restore Riparian Forest Buffers and Improve Stream Habitat in the Willamette Basin, Oregon Report, BY Oregon DEQ, Water Quality Division, Watershed Management Section, March 2010 http://www.deq.state.or.us/wq/tmdls/docs/WillametteRipCost030310.pdf):

Increase in Effective Shade after Restoration of System Potential Vegetation (N. Willamette Basin)



Restoration along Johnson Creek in Portland. Photo by Ryan Michie, DEQ.

Lack of Riparian Area Protection

G. COST AND BENEFITS ANALYSIS *(OAR 340-042-0040 (4) (l) (N) and (O) and OAR 340-042-0080 (3) (a) (E), EPA's Key Watershed Planning Components with Nine Key NPS Elements, and EPA NPDES Phase I and II Stormwater Rules)*

What information should be provided?
Estimate the Costs to Implement the Plan, Including Management Measures, Administration, Information/Education Activities, and Monitoring. In addition, identify the Sources and Amounts of Financial and Technical Assistance and Associated Authorities Available to Implement the Management Measures.

DMAs are recommended to conduct a fiscal analysis to determine what resources are necessary to develop, implement, and maintain the structural and programmatic BMPs, and where and how these resources will be obtained.

Why should this be included?
Including this information in the plan will help to select the most cost effective and other recommended BMPs needed to meet the TMDL LAs and WLAs, if applicable.

Where can this information be found?
The WQMP will list the specific most effective and other recommended BMPs by pollutant and source. Most of the structural BMPs in the tables included in **Appendix J** have estimated costs. For programmatic BMPs, **Appendix I** includes cost estimates for a few BMPs.

1. Estimate the Costs to Implement the Plan, Including Management Measures, Administration, Information/Education Activities, and Monitoring

Identify and quantify the following costs to implement the Plan:

LIST OF COST ELEMENTS TO CALCULATE FOR PLAN IMPLEMENATATION

- **a. Selected Most Effective and Other Recommended BMPs**
  - **i. Research the Unit Costs**
  - **ii. Multiply the Unit Costs by the Number of Units Required**
  - **iii. Translate Structural BMPs into Capital Improvement Plans**
- **b. Ongoing Maintenance**
- **c. Technical Assistance**
- **d. Administrative**
- **e. Information/Education Activities**
- **f. Monitoring**

Source: As Modified from *Guidance Manual for Total Maximum Daily Load Implementation Plans*, The Commonwealth of Virginia: Department of Conservation and Recreation, Department of Environmental Quality, July 2003

http://www.deq.state.va.us/tmdl/implans/ipguide.pdf

DMAs will need to calculate the costs to implement and maintain the most effective and other recommended structural and programmatic BMPs identified in their TMDL Implementation Plan. Most of the structural BMPs tables in **Appendix J** have estimated costs that may include construction, planting, operation, maintenance, technical assistance, administrative, information/education activities, monitoring, and recurring payments for lease, where applicable. For programmatic BMPs, **Appendix I** includes cost estimates for a few BMPs.

It may be necessary to utilize other cost estimate references, identified below, including talking with local estimates from contractors and builders, and estimates from stakeholders, to fully develop all cost elements.

As stated in the **Guidance Manual for Total Maximum Daily Load Implementation Plans**, The Commonwealth of Virginia, Department of Conservation and Recreation, Department of Environmental Quality, July 2003: "*some management measures might be more diffusely implemented across the watershed, and therefore the costs might be difficult to quantify. For example, developers across the watershed are encouraged to use fencing to prevent sediment runoff on their construction sites, and homeowners are encouraged through educational outreach to keep their neighborhood storm drains free of debris. These actions are voluntary, and therefore no specific operational costs are associated with them. However, costs would be associated with Information/Education activities.*"

a. Type and Number of BMPs To Meet the TMDL Load Allocation

In order to calculate the costs of implementing the plan requires determining the type and number of BMPs to be selected to meet the TMDL load allocation identified in the TMDL WQMP. In order to determine this, the following method is recommended:

XX Pounds of TSS [Equals] XX Pounds/Linear Foot of TMDL Pollutant Removed per BMP [Times] XX Number of BMPs

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(TSS Load Allocation) = (WQMP Provided Load Reduction Est. per BMP) X (Number of Needed BMPs)

The TMDL WQMP will provide the pollutant reduction amount per structural and programmatic BMPs identified to meet the TMDL load allocation. DMAs can use this load reduction estimate to calculate the number of needed BPMs.

The following table provides an example estimate of the type and number of BMPs needed:

EXAMPLE ESTIMATE TYPE AND NUMBER OF BMPS RECOMMENDED TO MEET THE TMDL LOAD ALLOCATION (based on A Total Maximum Daily Load Implementation Plan for Knox Creek and Pawpaw Creek Prepared for: Virginia Department of Environmental Quality Submitted September 10, 2007, http://www.deq.virginia.gov/export/sites/default/tmdl/implans/knoxpawip.pdf)

Table 5.6 Estimated residential waste control measures needed in the Knox Creek and Pawpaw Creek watersheds.

Control Measure		Knox Creek		Pawpaw Creek		
	VA Cost-Share Practice Number	Existing BMPs	Units Needed	Existing BMPs	Units Needed	Total Units Needed
Septic System Pump-out Program	RB-1	2	158	1	42	200
Sewer Connection	RB-2	0	0	0	0	0
Septic System Repair	RB-3	22	80	6	20	100
Septic System Installation/ Replacement	RB-4	6	374	2	82	456
Alternative Waste Treatment System	RB-5	0	24	0	6	30

b. BMPs Cost Estimates

Most of the structural BMPs in the tables included in **Appendix J** have estimated costs. For programmatic BMPs, **Appendix I** includes cost estimates for a few BMPs.

DMAs are recommended to multiply the total number of needed most effective and other recommended structural and programmatic BMPs identified in their implementation plan by all costs by the total number needed. These costs may include construction, planting, operation, maintenance, technical assistance, administrative, information/education activities, monitoring, and recurring payments for lease, where applicable.

The following tables provide Example State of Virginia TMDL Implementation Plan structural and programmatic BMPs costs estimate for residential areas. This includes construction, installation, operation, maintenance, education/information, and administration costs.

EXAMPLE STRUCTURAL AND EDUCATION BMPS COSTS ESTIMATE FOR RESIDENTIAL AREAS (based on A Total Maximum Daily Load Implementation Plan for Knox Creek and Pawpaw Creek Prepared for: Virginia Department of Environmental Quality Submitted September 10, 2007, http://www.deq.virginia.gov/export/sites/default/tmdl/implans/knoxpawip.pdf)

Table 5.11 Residential control measure costs and needs.

Residential Control Measure	Unit	Unit Cost	Knox Units	Knox Cost	Pawpaw Units	Pawpaw Cost
Septic Systems Pump-out Program (RB-1)	System	$250	158	$39,500	100	$25,000
Septic System Repair (RB-3)	System	$3,000	80	$240,000	30	$90,000
Septic System Installation/Replacement (RB-4)	System	$6,000	374	$2,244,000	105	$630,000
Alternative Waste Treatment System Installation (RB-5)	System	$11,400	24	$273,600	15	$171,000
Residential Education Program	Program	$3,750	0.75	$2,813	0.25	$938
Infiltration Trench	Acre-Treated	$5,285	12	$63,420	0	$0
Erosion and Sediment Control	Acre-Treated	$2,000	20	$40,000	3	$6,000
Vegetated Stream Buffer	Acres	$700	37	$25,900	6.6	$4,620

Rain Garden

EXAMPLE STRUCTURAL BMPS CAPITAL COSTS ESTIMATE (based on Stormwater BMP Performance Assessment and Cost-Benefit Analysis, *by* Capitol Region Watershed District, St. Paul, MN, January 22, 2010, http://www.capitolregionwd.org/documents/BMP_Report_Main_Body_View.pdf)

Table 4-1. Total Capital Cost of the APSIP.

	Total Cost	Design	Construction	Bond Interest*
Arlington-Hamline Facility	$799,087	$86,636	$487,488	$224,963
Como Park Regional Pond	$1,364,346	$147,926	$832,357	$384,063
Infiltration Trenches	$400,060	$47,904	$239,521	$112,635
Trench 1	$20,039	$2,400	$11,998	$5,642
Trench 2	$29,807	$3,569	$17,846	$8,392
Trench 3	$88,383	$10,583	$52,916	$24,884
Trench 4	$86,595	$10,369	$51,845	$24,380
Trench 5	$25,812	$3,091	$15,454	$7,267
Trench 6	$34,766	$4,163	$20,815	$9,788
Trench 7	$29,058	$3,479	$17,397	$8,181
Trench 8	$85,599	$10,250	$51,249	$24,100
Rain Gardens	$160,244	$19,193	$95,966	$45,085
Arlington-McKinley	$4,116	$494	$2,471	$1,150
Asbury North	$9,246	$1,106	$5,532	$2,607
Asbury South	$11,970	$1,433	$7,164	$3,374
Frankson-McKinley	$10,921	$1,309	$6,545	$3,067
Hamline Midway	$103,172	$12,365	$61,824	$28,983
Pascal Center	$5,421	$648	$3,239	$1,533
Pascal North	$6,750	$806	$4,028	$1,917
Pascal South	$8,648	$1,032	$5,162	$2,454
APSIP Total:	**$2,723,737**	**$301,659**	**$1,655,332**	**$766,746**

*Does not include bond interest paid by project partners.

EXAMPLE STRUCTURAL BMP (RAIN GARDENS) OPERATION AND MAINTENANACE CAPITAL COSTS ESTIMATE (based on Stormwater BMP Performance Assessment and Cost-Benefit Analysis, *by* Capitol Region Watershed District, St. Paul, MN, January 22, 2010, http://www.capitolregionwd.org/documents/BMP_Report_Main_Body_View.pdf)

Table 4E-8. 2008 Total Operation and Maintenance Costs for the Rain Gardens.

	Staff Hours[a]	Labor	Equipment and Materials	Contract Service	Total
Arlington-McKinley	41.0	$462	$186	$0	$649
Asbury North	57.6	$698	$204	$0	$902
Asbury South	56.8	$1,071	$401	$0	$1,472
Frankson-McKinley	91.8	$1,149	$402	$0	$1,551
Hamline Midway	18.6	$188	$60	$648	$896
Pascal Center	54.6	$529	$184	$0	$713
Pascal North	51.6	$517	$112	$0	$628
Pascal South	33.8	$527	$205	$0	$732
Total:	405.6	$5,142	$1,755	$648	$7,544

[a]Includes both staff and volunteer hours.

c. Technical Assistance Cost Estimates

The following table identifies the amount of agricultural and residential full time equivalent (FTE) technical assistance needed to implement the Total Maximum Daily Load Implementation Plan for Knox Creek and Pawpaw Creek in Virginia. One FTE is equal to one full-time staff member. The estimate of technical assistance should take into account the following: administration and management services, including salaries, regulatory fees, and supplies, as well as in-kind services efforts, such as the work of volunteers and the donation of facility use. This will include Information and education efforts.

EXAMPLE TECHNICAL ASSISTANCE NEEDS (based on A Total Maximum Daily Load Implementation Plan for Knox Creek and Pawpaw Creek Prepared for: Virginia Department of Environmental Quality Submitted September 10, 2007, http://www.deq.virginia.gov/export/sites/default/tmdl/implans/knoxpawip.pdf)

Table 5.9 Recommended technical assistance needs for implementation in the Knox Creek and Pawpaw Creek watersheds.

	Years 1-5			Years 6-10			
	Estimated Agricultural	Recommended Agricultural	Estimated Residential	Recommended Residential	Estimated Agricultural	Estimated Residential	Recommended Agricultural /Residential
Impairment	FTE	FTE	FTE	FTE	FTE	FTE	FTE
Knox Creek	1.22	1	2.32	2.5	1.22	0.13	1
Pawpaw Creek	0.41	0.5	0.54	0.5	0.41	0.02	0.5
Total	1.63	1.5	2.86	3.0	1.63	0.15	1.5

d. Monitoring Cost Estimates

The TMDL Implementation Plan is recommended to include both implementation monitoring and effectiveness monitoring elements in **Section J. Tracking Implementation of TMDL Implementation Plan**. Implementation monitoring involves developing a set of criteria to determine whether loading reductions are being achieved and progress is being made toward attaining (or maintaining) water quality goals, and specify what measures will be taken if progress has not been demonstrated. Effectiveness monitoring involves determining whether the plan is being implemented appropriately and whether progress toward attainment or maintenance of water quality goals is being achieved.

The cost to implement the DMA proposed monitoring program elements are recommended to be provided in this section of the implementation plan. Elements to consider for inclusion are as follows:

- Number of years in which monitoring will be conducted.
- Implementation monitoring is data collected to account for work done and the success of the project such as the type of activity, the location of the activity (latitude and longitude or other appropriate description), a measure of the size of the project, the date project was done, and project success (yes/no, percentage, etc. as appropriate.
- Qualitative monitoring which may include:
    - photo documentation of improvement in stream bank vegetation/cover for residential properties or vegetated stormwater containment/collection swales (i.e., photos before planting, shortly after planting, and after plant maturation),
    - documentation of relative sediment volume (i.e., high, medium, or low) collected from detention ponds or filters in stormwater treatment systems.
- If applicable, quantitative monitoring of any fixed or temporary monitoring instrumentation purchase, installation, and maintenance.
- If applicable, quantitative monitoring of any annual sampling and laboratory costs.

Source: Urban Stormwater BMP Performance Monitoring, A Guidance Manual for Meeting the National Stormwater BMP Database Requirements, April 2002 http://water.epa.gov/scitech/wastetech/guide/stormwater/upload/2006_10_31_guide_stormwater_montcomplete.pdf

e. Final Costs Estimate

EXAMPLE FINAL COSTS ESTIMATE (based on A Total Maximum Daily Load Implementation Plan for Knox Creek and Pawpaw Creek Prepared for: Virginia Department of Environmental Quality Submitted September 10, 2007, http://www.deq.virginia.gov/export/sites/default/tmdl/implans/knoxpawip.pdf)

Table 5.13 Total estimated costs to meet the Knox Creek and Pawpaw Creek TMDLs. Impairment

	Agricultural BMPs ($)	Residential BMPs ($)	Industrial BMPs ($)	Streambank Stabilization ($)	Tech. Assist. ($)	Total ($)
Knox Creek	$467,556	$2,929,240	$17,465,200	$0	$1,125,000	$21,986,995
Pawpaw Creek	$27,700	$642,458	$5,718,000	$3,286,800	$375,000	$10,049,958
Total	$495,256	$3,571,698	$23,183,200	$3,286,800	$1,500,000	$32,036,953

The total cost to implement the BMPs needed in this watershed is estimated at $32 million. However, $23 million, or 72%, of the total cost is estimated for the industrial BMPs, which will largely be covered by these industries.

f. Benefit/Costs Estimate

EXAMPLE COST/BENEFIT SUMMARY (based on Moore's Creek Fecal Coliform TMDL Implementation Plan, Thomas Jefferson Planning District Commission, Prepared by the Thomas Jefferson Planning District Commission for the Virginia Department of Environmental Quality and the Virginia Department of Conservation and Recreation, http://www.deq.virginia.gov/export/sites/default/tmdl/implans/mooresip.pdf)

Table 6.10 Cost/Benefit Summary

Measure	Reduces Input From	Reduction (bacterial cfu/yr)	Cost	Reduction/$
Animal exclusion buffers and	Cattle and grasslands	$1.024 * 10^{14}$	$325,000	$3.151 * 10^{8}$
Streambank protection and stabilization	Grasslands and residential	$2.346 * 10^{12}$	$730,905	$3.210 * 10^{6}$
Maintenance and repairs for sanitary sewer	Sewer leakage	$7.239 * 10^{12}$	$8,900,000	$8.134 * 10^{5}$
Connection of Oak Hill to public sewer	~20 leaking septic systems	$3.059 * 10^{12}$	$1,210,000	$2.528 * 10^{6}$
Other public sewer connection projects	~96 leaking septic systems + 1 mass drain field	$1.172 * 10^{13}$	$4,257,525	$2.753 * 10^{6}$
Repair/replace other septic systems/educate owners	Straight pipes and~118 leaking septic systems	$4.244 * 10^{13}$	$733,000	$5.790 * 10^{7}$
Education, planning and maintenance activities	urban land uses	$1.148 * 10^{14}$	$3,804,550	$3.017 * 10^{7}$

From Table 6.10, it is clear that animal exclusion and buffers are likely to offer the greatest reduction in bacterial populations in Moore's Creek, and should be a very high priority. Repair or replacement of septic systems appears to

be more cost-effective than public sewer connection, although in neighborhoods with small lots, public sewer connection may be the only option.

The residential programs will play an important role in improving water quality, since human waste can carry with it human viruses in addition to the bacterial and protozoan pathogens that all fecal matter can potentially carry. In terms of economic benefits to homeowners, an improved understanding of on-site sewage treatment systems, including knowledge of what steps can be taken to keep them functioning properly and the need for regular maintenance, will give homeowners the tools needed for extending the life of their systems and reducing the overall cost of ownership. The average septic system will last 20 to 25 years if properly maintained. Proper maintenance includes: knowing the location of the system components and protecting them (e.g., not driving or parking on top of them), not planting trees where roots could damage the system, keeping hazardous chemicals out of the system, and pumping out the septic tank every three to five years. The cost of proper maintenance, as outlined here, is relatively inexpensive in comparison to repairing or replacing an entire system. Additionally, the repair/replacement and pump-out programs will benefit owners of private sewage (e.g., septic) systems, particularly low-income homeowners, by sharing the cost of required maintenance.

In addition to the benefits to individual landowners, the economy of the local community will be stimulated through expenditures made during implementation, and the infusion of dollars from funding sources outside the impaired areas. Building contractors and material suppliers who deal with septic system pump-outs, private sewage system repair and installation, fencing, and other BMP components can expect to see an increase in business during implementation. Additionally, income from maintenance of these systems should continue long after implementation is complete.

2. Identify the Sources and Amounts of Financial and Technical Assistance and Associated Authorities Available to Implement the Management Measures

DMAs will most likely use a combination of funding sources including general funds, stormwater district fees (if in existence), and other local federal, state, and private sources. **Appendix H** identifies many possible funding sources. Also, refer to EPA's *Guidebook of Financial Tools: Paying for Sustainable Environmental Systems*, which is available for download at www.epa.gov/efinpage/guidbkpdf.htm. This guidebook identifies the following ways to fund the implementation of the TMDL Implementation Plan:

Some of the costs of implementing your TMDL Implementation Plan can be defrayed by leveraging existing efforts and seeking in-kind services. Some examples follow:

- *Use existing data sources.* Most geographic areas have some associated background spatial data in the public domain, such as digital elevation models, stream coverages, water quality monitoring data, and land cover data in the form of imagery like orthophotos quads or raster satellite image files.
- *Use existing studies.* Many agencies have reports of previous analyses, providing useful baseline information and data, such as delineated sub watersheds or a historical stream monitoring record.
- *Use partnerships.* State, county, or federal agencies working as technical assistance providers and implementing natural resource program initiatives can offer computer services and expertise, such as performing GIS analysis or weaving together elements of different programs that might apply to the local area. They might be in a position to write part of the overall watershed plan if they have existing generalized watershed characterization studies.
- *Cover incidental/miscellaneous costs through contributions.* For example, staff time to assemble needed elements, supplies, and meeting rooms for a stakeholder or scoping meeting can all be donated.

EXAMPLE FUNDING STRATEGY: (based on City of Springfield (Oregon) Stormwater Management Plan, 8.0 Financial Strategy, Prepared by: City of Springfield, Public Works Environmental Services Division, January 2004.
(https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/5828/Springfield_Stormwater_Master_Plan.pdf?sequence=1)

Operations within the City's stormwater management program, including development and implementation of the … plan is completely funded by "drainage user fees," which are billed on a monthly basis. Drainage user fees are made up of a base fee plus a fee calculated on impervious surface areas, including roofs and paved areas (such as parking lots and roads). Single family and duplex residences are charged a flat fee based on average amounts of impervious area. The stormwater drainage system Capital Improvements Program (CIP) is funded, in part, by user fees, and, in part by stormwater drainage system development charges (SDCs).

H. MEASURABLE GOALS AND MILESTONES FOR ATTAINING WATER QUALITY STANDARDS AND BENEFICIAL USES *(OAR 340-042-0040 (4) (l) (D) and (F)) and OAR 340-042-0080 (3) (a) (B) and EPA's Key Watershed Planning Components with Nine Key NPS Elements)*

What information should be provided?
Develop interim, measurable milestones for determining whether management measures are being implemented and develop a schedule for implementing the Plan. The way to determine if the objectives of the implementation plan are being met is to develop measurable goals and milestones. By developing interim, measurable milestones on the implementation of the key elements of the implementation plan.

Why should this be included?
Including this information in the plan will help to ensure that the TMDL Implementation Plan is implemented to ultimately meet water quality standards within the TMDL basin(s). In addition, both the DMA and DEQ can determine whether the BMPs are being implemented to meet the load allocation.

Where can this information be found?

The selected most effective and other recommended programmatic and structural BMPs are provided by the DMA in **Section II, F;** the cost and benefits of implementing the BMPs is in **Section II, G**, the schedule is in **Section II, H**, and the results of implementation and effectiveness monitoring have been developed in **Section II, I.**

1. Develop Interim, Measurable Milestones for Determining Whether Management Measures are Being Implemented

The purpose of implementing the TMDL Implementation Plan is to ultimately meet water quality standards. There are three elements of this objective:

1. *Protection*: Prevent the degradation of healthy waters.
2. *Restoration*: Develop and implement plans to treat and reduce pollutants.
3. *Maintenance of Reductions*: Institutionalize technical and administrative procedures to offset the introduction of new pollutants.

What Are Measurable Goals?

Measurable goals are generally defined as BMP design objectives or goals that quantify the progress of program implementation and the performance of your BMPs. They are objective markers or milestones that DMAs will use to track the progress and effectiveness of selected BMPs in reducing pollutants to meet TMDL load allocations. The implementation plan is recommended to include a variety of short- and long-term goals. At a minimum, your measurable goals are recommended to contain descriptions of actions DMAs will take to implement each BMP, what you anticipate to be achieved by each goal, and the frequency and dates for such actions to be taken.

This section of the implementation plan is recommended to address the following questions:

- Who will be responsible for tracking control measure installations?
- What are the implementation milestones?
- What type of water quality monitoring will be continued during implementation?
- What annual goals are to be achieved during implementation?
- What are the methods to be used to assess "reasonable assurance" of successful implementation?
- What methods will be used during implementation for evaluating progress?
- What actions will be taken if water quality standards are not attained?

Expected progress in implementation is established with two types of milestones, *BMPs Implementation* and *water quality milestones*. Implementation milestones establish the percentage of implementation actions installed within certain timeframes. (For example, 50% of riparian area restoration within first two years, or 75% of all streets receiving street sweeping within the first year.) Water quality milestones establish the corresponding improvements in water quality that can be expected as the implementation milestones are met.

The establishment of implementation milestones and water-quality milestones are inextricably linked. The process consists of a trade-off between quickly attaining water-quality goals and the availability of implementation resources. Some implementation actions require an extensive time period before water quality improvements can be measured. For example, improvements in water quality from planting trees along a stream will not be measurable until the trees have been in place for some time.

EXAMPLE IMPLEMENTATION AND WATER QUALITY MILESTONES (based on *A Total Maximum Daily Load Implementation Plan for Dumps Creek, Submitted by: MapTech,* Prepared for: Virginia Department of Environmental Quality Submitted April 2008, http://www.deq.state.va.us/tmdl/implans/ccbrip.pdf)

Table 6.2 Proposed milestones for implementation of control measures.

	Implementation Milestones				Water Quality Milestones: Percentage of Load Reduction Goals	
Date	Reclamation of AML (acres)	Haul Road Stabilization (acres)	Vegetated Buffers (acres)	Streambank Stabilization (feet)	TDS (%)	Sediment (%)
1/1/2008	Current Implementation				9	24
1/1/2009	10	8	0	500	14	30
1/1/2010	25	17	0	500	22	34
1/1/2011	45	27	0	500	33	38
1/1/2012	60	38	0	500	41	41
1/1/2013	100	50	0	500	63	50
1/1/2014	150	63	0	500	89	60
1/1/2015	200	77	5	1,000	100	76
1/1/2016	250	91	5	1,500	100	90
1/1/2017	273	106	5	2,000	100	99
1/1/2018	273	123	5	2,640	100	100
1/1/2023	De-listing from 303(d) List				100	100

ADDITIONAL EXAMPLE IMPLEMENTATION AND WATER QUALITY MILESTONES (based on A Total Maximum Daily Load Implementation Plan for Knox Creek and Pawpaw Creek Prepared for: Virginia Department of Environmental Quality Submitted September 10, 2007, http://www.deq.virginia.gov/export/sites/default/tmdl/implans/knoxpawip.pdf)

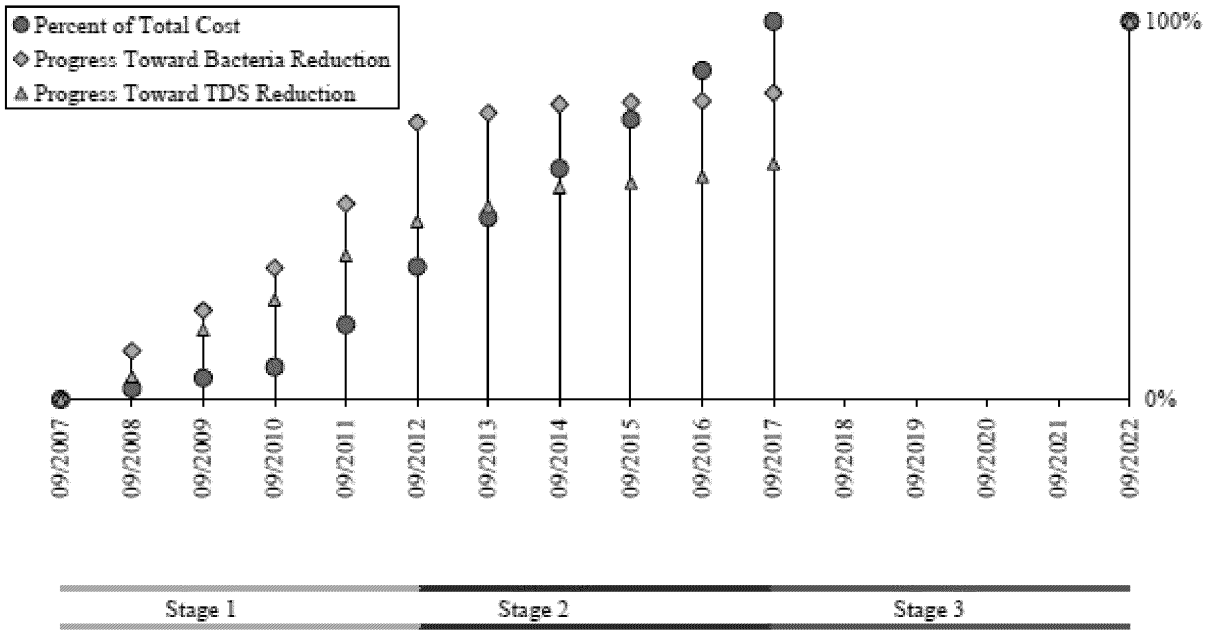


Figure 6.1 Timeline for implementation in the Knox Creek watershed.

2. Develop a Schedule for Implementing the Plan

The first step in producing a TMDL Implementation Plan schedule is to know the steps and timeline for development, submittal, and approval by DEQ of the plan. The following **Table 7** provides a recommended timeline:

Table 7. TMDL Implementation Plan Recommended Timeline

DATE	ACTION
BEGINNING	**DEQ Sends TMDL and WQMP with Cover Letter to DMA.**
WITHIN 18 MONTHS	**DMA Begins from Date of Letter Receipt to Prepare TMDL Implementation Plan and Submits to DEQ.** **DMA Conducts Public Review Opportunities for Review and Comment on Draft Plan**
WITHIN 90 DAYS	**DEQ Receives and Reviews Implementation Plan and Provides Comments to DMA.**
2nd YEAR	**DMA Secures Funding and Begins to Implement TMDL Implementation Plan.**
4th YEAR	**DMA Conducts Program Implementation Plan Effectiveness Monitoring and Annual Reporting to DEQ.**
5th YEAR	**Program Monitoring Data Shows Need to Revise Implementation Plan and TMDL– DMA Revises Implementation Plan and Submits to DEQ.**
5th YEAR, 2nd MONTH	**DEQ Provides Comments on Revised Implementation Plan.**
5th YEAR, 6th MONTH	**DMA Implements Revised Implementation Plan and Conducts Program Effectiveness Monitoring and Reporting to DEQ.**
6th YEAR	**DMA and/or DEQ Conducts Ambient (In -Stream) Monitoring to Determine if Water Quality Standards are Met.**
VARIES	**When Ambient (In -Stream) Monitoring Data by Pollutant Shows Trend of Compliance, DEQ Sends Letter to DMA Stating that for Now DMA Meets TMDL and / or Standard for Pollutant.**

As part of the TMDL Implementation Plan schedule, timelines for implementing management strategies are recommended to be included. The following programmatic and structural BMPs implementation timelines are provided as examples:

EXAMPLE IMPLEMENTATION TIMELINE (based on *A Total Maximum Daily Load Implementation Plan for Dumps Creek, Submitted by: MapTech,* Prepared for: Virginia Department of Environmental Quality Submitted April 2008, http://www.deq.state.va.us/tmdl/implans/ccbrip.pdf)

Table 6.2 Timeline for implementation in the Knox Creek watershed – Stage I.

Knox Creek Implementation Milestones	Existing	Year 1	Year 2	Year 3	Year 4	Year 5
Cumulative Progress Toward BMP Installation						
Agricultural:						
Grazing Land Protection System (SL-6)	0%	10%	20%	30%	40%	50%
Stream Protection System (WP-2T)	0%	10%	20%	30%	40%	50%
Improved Pasture Management	0%	10%	20%	30%	40%	50%
Waste Storage Facilities (WP-4) - Horses	0%	10%	20%	30%	40%	50%
Manure Incorporation	0%	10%	20%	30%	40%	50%
Vegetated Stream Buffer	0%	10%	20%	30%	40%	50%
Residential:						
Septic Systems Pump-out Program (RB-1)	0%	20%	40%	60%	80%	100%
Septic System Repair (RB-3)	0%	20%	40%	60%	80%	100%
Septic System Installation/Replacement (RB-4)	0%	20%	40%	60%	80%	100%
Alternative Waste Treatment System Installation (RB-5)	0%	20%	40%	60%	80%	100%
Residential Education Program	0%	20%	40%	60%	80%	100%
Infiltration Trench	0%	0%	0%	0%	0%	0%
Erosion and Sediment Control	0%	0%	0%	0%	0%	0%
Vegetated Stream Buffer	0%	10%	20%	30%	40%	50%
Industrial:						
Reclamation of Abandoned Mine Land	0%	0%	0%	0%	10%	25%
Dirt Road Stabilization	0%	0%	0%	0%	10%	25%
Forest Harvesting BMPs	0%	0%	0%	0%	10%	25%
Exceedance of Endpoints (%)						
Instantaneous EC Standard (235 cfu/100mL)	47.8%	41.7%	36.6%	31.2%	23.0%	12.8%
Geometric Mean EC Standard (126 cfu/100mL)	91.7%	86.1%	83.3%	63.9%	47.2%	25.0%
TDS Endpoint (369 mg/L)	16.2%	15.3%	13.2%	12.0%	10.0%	8.6%
Cost (% of Total)	0%	3.0%	6.0%	9.0%	20.3%	35.7%

CONTINUED EXAMPLE IMPLEMENTATION TIMELINE (based on *A Total Maximum Daily Load Implementation Plan for Dumps Creek, Submitted by: MapTech,* Prepared for: Virginia Department of Environmental Quality Submitted April 2008, http://www.deq.state.va.us/tmdl/implans/ccbrip.pdf)

Table 6.3 Timeline for implementation in the Knox Creek watershed – Stages II and III.

Knox Creek Implementation Milestones	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15
Cumulative Progress Toward BMP Installation						
Agricultural:						
Grazing Land Protection System (SL-6)	60%	70%	80%	90%	100%	100%
Stream Protection System (WP-2T)	60%	70%	80%	90%	100%	100%
Improved Pasture Management	60%	70%	80%	90%	100%	100%
Waste Storage Facilities (WP-4) - Horses	60%	70%	80%	90%	100%	100%
Manure Incorporation	60%	70%	80%	90%	100%	100%
Vegetated Stream Buffer	60%	70%	80%	90%	100%	100%
Residential:						
Septic Systems Pump-out Program (RB-1)	100%	100%	100%	100%	100%	100%
Septic System Repair (RB-3)	100%	100%	100%	100%	100%	100%
Septic System Installation/Replacement (RB-4)	100%	100%	100%	100%	100%	100%
Alternative Waste Treatment System Installation (RB-5)	100%	100%	100%	100%	100%	100%
Residential Education Program	100%	100%	100%	100%	100%	100%
Infiltration Trench	20%	40%	60%	80%	100%	100%
Erosion and Sediment Control	20%	40%	60%	80%	100%	100%
Vegetated Stream Buffer	60%	70%	80%	90%	100%	100%
Industrial:						
Reclamation of Abandoned Mine Land	40%	55%	70%	85%	100%	100%
Dirt Road Stabilization	40%	55%	70%	85%	100%	100%
Forest Harvesting BMPs	40%	55%	70%	85%	100%	100%
Exceedance of Endpoints (%)						
Instantaneous EC Standard (235 cfu/100mL)	11.6%	10.5%	10.2%	10.1%	9.1%	0%
Geometric Mean EC Standard (126 cfu/100mL)	25.0%	25.0%	25.0%	25.0%	22.2%	0%
TDS Endpoint (369 mg/L)	7.9%	7.1%	6.9%	6.7%	6.1%	Healthy Aquatic Life
Cost (% of Total)	48.6%	61.4%	74.3%	87.1%	100.0%	100%

I. Performance Monitoring (*OAR 340-042-0080 (3) (a) (C) and EPA's Key Watershed Planning Components with Nine Key NPS Elements*)

What information should be provided?
Provide for performance monitoring with a plan for periodic review and revision of the implementation plan. Performance Monitoring means monitoring implementation of management strategies, including sector-specific and source-specific implementation plans, and resulting water quality changes. Therefore, performance monitoring needs to include tracking of implementation as well as monitoring of water quality indicators.

Why should this be included?
Including this information in the plan will help to ensure that the TMDL Implementation Plan is implemented to ultimately meet water quality standards within the TMDL basin(s). In addition, both the DMA and DEQ can determine whether the BMPs are being implemented to meet the load allocation.

Where can this information be found?
The selected most effective and other recommended programmatic and structural BMPs are provided by the DMA in **Section II, F;** the cost and benefits of implementing the BMPs is in **Section II, G**, the schedule is in **Section II, H**, and the results of implementation and effectiveness monitoring have been developed in **Section II, I.**

1. Implementation Monitoring

DMAs must monitor implementation of management strategies by tracking the progress and accomplishments of each activity. Implementation monitoring is data collected to account for work done and the success of the project in meeting its design target. This type of monitoring is recommended to be done for each project.

Implementation plans are recommended to:

- Estimate the targeted amount of work to be done (examples: miles of stream fencing, number of sediment retention ponds), and

- Describe some criteria for determining successful implementation (example tree survival after 8 years).

Reporting is recommended to include the amount of work done and the amount of completed work that is on target to be successful. Critical data includes the type of activity, the location of the activity (latitude and longitude or other appropriate description), a measure of the size of the project, the date project was done, and project success (yes/no, percentage, etc. as appropriate.) A robust system for tracking implementation is recommended in order to describe the role of management actions on water quality changes.

2. Effectiveness Monitoring

Effectiveness monitoring is data collected to measure the change caused by implementation actions. Effectiveness monitoring can occur at the project level or over the entire program (jurisdiction).

Many larger DMAs are already conducting water quality monitoring that can be used to evaluate the effectiveness of their pollution reduction efforts. These quantitative activities may have been undertaken voluntarily or required as part of an NPDES permit or other regulatory requirement. These jurisdictions are expected to describe the effectiveness of their TMDL implementation efforts in reducing pollutant loads.

While quantitative monitoring methods are preferred in most cases, qualitative methods may provide an effective measurement of implementation progress in some instances. Examples may include photo documentation of improvement in stream bank vegetation/cover for residential properties or vegetated stormwater containment/ collection swales (i.e., photos before planting, shortly after planting, and after plant maturation), or the documentation of relative sediment volume (i.e., high, medium, or low) collected from detention ponds or filters in stormwater treatment systems. While these methods do not provide quantitative information on the effectiveness of the projects, they do illustrate progress, and can be combined with other monitoring efforts to show success of implementation activities.

Effectiveness monitoring can be conducted at different scales ranging from at an individual project, to across the entire jurisdiction. Each scale has its own advantages and challenges. Measuring at the project scale gives you data on actual pollutant reductions; but monitoring the effectiveness of every implementation action is often impractical. Monitoring for changes at the jurisdiction scale may reduce the number of monitoring locations; but, but a number of confounding impacts across a jurisdiction makes measuring the effect of localized restoration actions at the larger landscape scale difficult.

Appropriate monitoring indicators, spatial scale, and time scale depend on the type of implementation action. For example, the most sensitive indicator to measure the effectiveness of a riparian fencing project would be different from the indicator used for manure management projects. Likewise, the appropriate temporal and spatial scales for measuring changes in an indicator would be different for these two project types with changes from the riparian planting taking place over the scale of 5-50 years but changes from manure management projects being measureable within 1-5 years.

Successful effectiveness monitoring depends on drawing the connection between causes (implementing a management activity) and resulting effects (changes in water quality indicators). The relationship between the management activities and the measured indicator is recommended to be explicitly identified either in a sampling design that isolates the cause and effect relationship (Before, After, Control, Impact (BACI) or through modeled relationships that identify any actions, natural or anthropogenic, that might influence the indicator. Using trends in water quality or

compliance with TMDL targets can be used as effectiveness monitoring if sufficient documentation exists to tie changes in water quality to management activities.

DMAs should consult with DEQ to ensure that their monitoring and evaluation strategies are adequate and do not duplicate other efforts or involve unnecessary data collection. For practical reasons, there is not a one-size-fits-all expectation for monitoring effectiveness. DEQ will be available to work directly with DMAs to establish a mechanism for monitoring effectiveness.

As mentioned previously, DEQ does not expect each DMA, particularly smaller jurisdictions, to implement its own water quality monitoring program. DMAs that are not able to undertake an evaluation of effectiveness on their own are expected to participate in discussions with DEQ and other entities in the area (e.g., watershed councils, Soil and Water Conservation Districts, other municipalities). These discussions will help identify effectiveness monitoring needs and discuss how resources could be pooled to implement an effectiveness evaluation strategy for the area.

The tables in **Appendix M** identify the recommended implementation and effectiveness monitoring by pollutant.

Failing Septic System

J. DEVELOP AN EVALUATION FRAMEWORK TO MEET PLAN REVIEW, REVISION, AND REPORTING REQUIREMENTS (*OAR 340-042-0040 (4) (l) (G) and OAR 340-042-0080 (3) (a) (C), EPA NPDES Phase I and II Stormwater Rules, and EPA's Key Watershed Planning Components with Nine Key NPS Elements, and EPA NPDES Phase I and II Stormwater Rules*)

What information should be provided?
Generally, two reports are recommended to be submitted to DEQ on a regular basis. These reports are recommended to include descriptions of DMA's intention to review its implementation plan and report to DEQ on the frequency specified in the TMDL WQMP. Generally, the implementation plan review should be conducted once every five years and results of that review submitted to DEQ. In addition, a report should be submitted to DEQ on an annual basis describing the progress of the DMA's management strategies.

Why should this be included?
Including this information in the plan will help to ensure that implementation of the TMDL Implementation Plan is being tracked and reported to DEQ. In addition, reporting of any necessary changes to the plan and specifically BMPs being implemented is important to ensure the plan will meet TMDL load allocations.

Where can this information be found?
The TMDL WQMP will provide further guidance on how and what to report.

1. Annual Progress Report

This report tracks implementation of each management strategy. Typically, the TMDL WQMP specifies the frequency of reporting. If there is no frequency specified in the WQMP, a progress report should be submitted to DEQ ***once a year***.

<u>The (Annual) Progress Report is recommended to include:</u>

- The status of BMP implementation with an assessment of the appropriateness of your identified BMPs and progress towards achieving identified measurable goals;
- Results of information collected and analyzed, including monitoring data, if any, during the reporting period;
- A summary of the implementation you plan to undertake during the next reporting cycle;
- A change in any identified BMPs or measurable goals;
- Any proposed changes to the TMDL Implementation Plan, along with justification
- Other entities responsible for implementing aspects of the implementation plan, and
- Change in people implementing and coordinating.

2. 5-Year Implementation Plan Review Report

All DMAs are expected to review ***every five years*** and, if necessary, revise their implementation plan.

EXAMPLE:

[Name of DMA] will track TMDL implementation activities and report to DEQ annually by December 31 on progress and accomplishments.
Note: If a DMA uses the matrix in Appendix D to describe their TMDL implementation activities, one simple way to satisfy the reporting requirement is to fill in the "status" column for each strategy and submit the spreadsheet to DEQ.
[Name of DMA] will evaluate this Implementation Plan every five years following submittal. The evaluation will include a review of existing water quality data and other information to evaluate the effectiveness of the Plan relative to the pollution reduction goals. The report will describe what information was used in the evaluation, findings of the evaluation, and the basis for this reasoning. If the evaluation indicates that the Plan is not likely to be adequate to meet the pollution reduction goals, we will describe how we will modify the Plan or undertake other efforts to achieve these goals, and the timeline for accomplishing this.
In addition, [name of DMA] will review and revise this Implementation Plan as needed following DEQ reevaluation of the TMDL.

Grassed Swale

K. EVIDENCE OF COMPLIANCE WITH LAND USE REQUIREMENTS (*OAR 340-042-0080 (3) (A) (D)*)

This section of the TMDL Rule (OAR 340-042-0080(3) (a) (D)) requires the DMA to provide evidence of compliance with applicable statewide land use requirements, as stated:

(OAR 340-042-0080(3) (a) (D)) *"To the extent required by ORS 197.180 and OAR Chapter 340, Division 18, provides evidence of compliance with applicable statewide land use requirements."*

What information should be provided?
To provide evidence that a TMDL Implementation Plan is in compliance with local land use requirements, in most cases, the plan should:

1. Identify applicable acknowledged local comprehensive plan provisions and land use regulations, and

2. Explain how the implementation plan is consistent with these local planning requirements or what steps will be taken to make the local planning requirements consistent with the implementation plan.

Another important requirement is that the DMA's planning director will need to send a letter to DEQ, certifying that their Comprehensive Plan and implementing ordinances comply or will comply by a given timeline with the applicable management measures identified in their TMDL Implementation Plan and their compliance with applicable statewide land use compliance. This letter will most likely be added with transmittal of the TMDL Implementation Plan.

Why should this be included?
Including this information in the plan will help to ensure that implementation of the TMDL Implementation Plan meets the state land use rules and regulations.

Where can this information be found?
A city or county will need to review, and if required, update their comprehensive plan and applicable implementing ordinances.

In order for an urban and rural residential DMA to meet this land use requirement, most likely a city or county may determine it is necessary to review, and if required, update their comprehensive plan and applicable implementing ordinances.

<u>Specifically, revising or adopting the following development ordinances:</u>

- Erosion and Sediment Control.
- Stormwater Quantity and Quality Management Control and Treatment.
- Wetland, Riparian, and Other Environmentally Sensitive Areas Protection.

- Hillside Development.
- Floodway and Floodplain Protection.
- Drinking Water Protection (DWP) Overlay Zone for Groundwater Wells.

Urban and rural nonpoint contributing sources will likely need development-related controls administered through local land use ordinances. Goal 6 requires local government compliance with state and federal environmental regulations. Post-TMDL development through plan amendments and zone changes will need to demonstrate compliance with the DEQ approved load allocation.

It is essential that city and county land use related TMDL Implementation Plan measures are enforced through the local plan. Without the land use implementation component, local governments risk the possibility of legal challenges to post-TMDL developments that could contribute to the water quality limited condition of a TMDL water body.

It is however important to note that a DMA will still need to meet both the TMDL load allocations and the state land use-planning goals individually. For example, even if a local jurisdiction has adopted a Goal 5 "safe harbor" for riparian and wetland areas protection, the DMA will need to analyze the adequacy of their Goal 5 program in meeting their TMDLs, particularly the shade requirements with a temperature TMDL. For most urban areas, the riparian areas are degraded and may contain very few trees. In addition, the "safe harbor" buffer widths may not provide sufficient shade to meet the temperature TMDL shade surrogates in some instances. A local jurisdiction may determine that they are in compliance with Goal 5 and not Goal 6 or their TMDL.

The land use Goals that interface with the urban management measures most directly are Goals 5, 6, and 7.

Goal 5 requires the inventory of riparian areas, wetlands, open space, wildlife habitat, and groundwater resources. Once local governments have identified significant resources in these categories, generally they will develop a program to protect the significant resources. See http://www.lcd.state.or.us/LCD/docs/goals/goal5.pdf for Goal 5 rules.

For public water systems which serve more that 10,000 or have more than 3,000 service connections; there are some land use requirements to be aware of. If the community chooses to delineate their wellhead protection area and have it approved by OHD, the wellhead protection area will become a **Goal 5** Resource to be addressed under the land use program. Those (larger) communities will need to incorporate land use planning elements into their wellhead protection management plan. A DEQ-certified Wellhead Protection Plan will automatically serve to address any Goal 5 protection requirements. More information on these requirements can be obtained from Doug White at the Department of Land Conservation and Development at (503) 373-0083.

Jurisdictions need to also carefully plan the location of future public supply wells in relation to potential and known areas of groundwater pollution, areas of known or suspected contamination, and sites noted on the DEQ Environmental Cleanup Site Discovery list. Locating public water supply wells in or adjacent to areas of known pollution problems is not advised. The pollution plume from a contaminated site can travel with groundwater across property boundaries where it can be pumped to the surface by water supply wells. Land uses surrounding these wells and their recharge areas are recommended to be designated to protect this natural resource. For example, depending on local conditions, industrial land uses are generally incompatible with groundwater recharge areas. It is strongly suggested that new public water supply wells and well fields not be located near areas with known groundwater quality problems.

Goal 6 provides a context through which water quality protection objectives can be integrated into a local government's comprehensive plan and development ordinances. Local governments can adopt local measures to protect ground and surface water from development impacts as long as they demonstrate a connection between the local measure and efforts to achieve or maintain water quality standards. This threshold is an important one in Oregon since areas within urban growth boundaries (UGBs) and "exception areas" have been designated for urban development to protect the rest of the landscape from urban encroachment. As with Goals 5 and 7, the state land use program allows and requires development restrictions on urban lands as long as there are findings that document a link to other land use program objectives.

Goal 6 states that local government comprehensive plans must be compliant with state and federal water quality laws and standards. A TMDL and the associated order issued by DEQ identify local governments as a DMA and set a schedule for compliance with a pollutant load allocation. This action on the part of DEQ clearly defines the local government's obligation for complying with water quality standards. Once this is established, Goal 6 provides one enforcement arm to insure that strategies are developed to reduce or eliminate water pollutant impacts from new development.

At the time of a comprehensive plan amendment, a local government must demonstrate compliance with all goals. A finding of compliance with the water quality provisions of Goal 6 can only be made if the local government is compliant with the schedule laid out in the TMDL order. Without this finding of compliance, a local government would be restricted from changing comprehensive plan zoning designations or making other changes to their comprehensive plans and policies that would influence water quality. See http://www.lcd.state.or.us/LCD/docs/goals/goal6.pdf for Goal 6 rules.

Goal 7 requires local governments to adopt plan policies to reduce risk to people and property from natural hazards. DLCD revised Goal 7 in 2002. The revised Goal requires updates of local plans to address new hazards information. The goal also encourages local governments to reduce hazard risks by keeping those areas in open space or low-density uses. Local government strategies to address known hazards can include restrictions for development activities in the flood plain and on steep slopes that are prone to erosion and landslides. See http://www.lcd.state.or.us/LCD/docs/goals/goal7.pdf for Goal 7 rules.)

The State Land Use Planning Goals and program is an integral part of ensuring state water quality rules and regulations are met. DEQ's water quality programs will not be implemented adequately, particularly for nonpoint source pollution without the tools that the state's land use planning program provides. Likewise, the state land use planning program requires the cooperation and inclusion of DEQ's water quality programs, rules, and regulations to reach the state land use plan natural resource goals.

The comprehensive land use identifies what type, the intensity, and the location of various land uses such as industrial, commercial, roads, utilities, parks, and open space and other public facilities are located. In addition, the comprehensive plan provides the framework for protecting and enhancing water quality. All water quality provisions in the land development code should be supported by the appropriate comprehensive plan goals and policies.

Oregon Statewide Planning **Goal 2**: Land Use Planning indicates that, *"all land use plans shall include identification of issues and problems, inventories and other factual information for each applicable statewide planning goal, evaluation of alternative courses of action and ultimate policy choices…"* Many comprehensive plans already have provisions that support water quality ordinances, particularly if any Goal 5 work has been completed. In addition to Goal 5, there are a number of Statewide Planning Goals that have water quality components to them. Perhaps the best way to address water quality is not to rely on one or two goals, but to recognize that most of the goals are in some way related to water quality, and when used in concert, they form a powerful basis for water quality ordinances.

EXAMPLE:

All of the strategies outlined here and listed in the matrix are consistent with [name of DMA's] land use plans. [Name of DMA] will evaluate and maintain consistency with local and statewide land use laws in any future actions related to TMDL implementation.

L. INFORMATION/EDUCATION COMPONENT THAT IDENTIFIES THE INFORMATION/EDUCATIONACTIVITIES NEEDED FOR IMPLEMENTING THE PLAN (*EPA's Key Watershed Planning Components with Nine Key NPS Elements and EPA NPDES Phase I and II Stormwater Rules*)

What information should be provided?
Provide in the TMDL Implementation Plan a description of the DMA's proposed information/education activities needed for implementing the plan.

Why should this be included?
Although it is important to let people know about the water quality problems in the watershed, sometimes simply informing and educating people on the issues is not enough to initiate behavior change. Behavior change occurs over time. First, audiences may need to be made aware of the issue or problem. Then they may need to be educated on the problems facing the watershed. Finally, they need to know what actions they could take to help address those problems.

Where can this information be found?
The following EPA guidance document, **Getting In Step, A Guide for Conducting Watershed Outreach Campaigns,** December 2003 EPA 841-B-03-002, http://www.epa.gov/owow/watershed/outreach/documents/getnstep.pdf, provides the following six steps in developing an effective information/education program:

1. Define information/education goals and objectives.
2. Identify and analyze the target audiences.
3. Create the messages for each audience.
4. Package the messages for various audiences.
5. Distribute the messages.
6. Evaluate the information/education program.

This guide provides a brief description of the activities that occur in each of these steps:

"***Step 1: Define information/education goals and objectives.***
The outreach goals and objectives will reinforce the overall watershed goals and objectives and should be specific, measurable, action-oriented, and time-focused. Keep the desired outcome in mind when developing your objectives. Do you want to create awareness, provide information, or encourage action among your target audience? It is very important to make your objectives as specific as possible and to include a time element as well as a result. This approach will make it easier to identify specific tasks and will enable you to evaluate whether you have achieved the objectives.

Step 2: Identify and Analyze the Target Audience
Next, you should identify the audiences you need to reach to meet your objectives. The target audience is the group of people you want to reach with your message. You should break down your target audience into smaller segments using demographics,

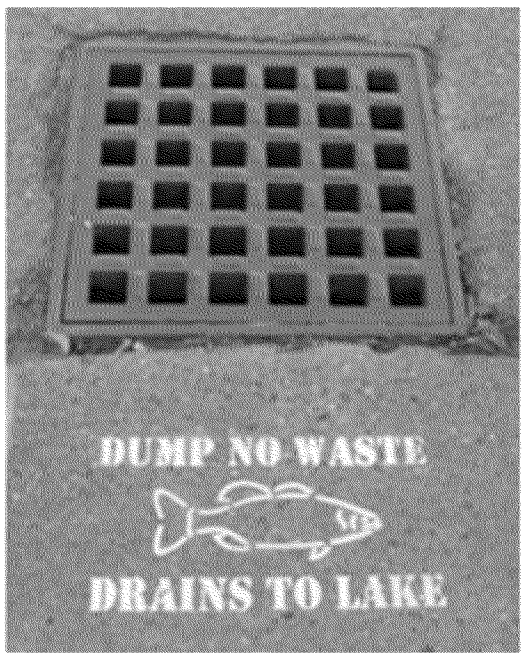
location, occupation, watershed role, and other factors. If your target audience is too broad, chances are you will not be able to develop a message that engages and resonates with the entire audience. Be creative in defining and developing perspectives on your target audiences and in finding out what makes them tick.

Step 3: Create the Message

After gathering information on members of the target audience, you are ready to create a message that will engage them and help achieve your watershed planning objectives. To be effective, the message must be understood by the target audience and appeal to people on their own terms. The message should articulate what actions the audience should take. These actions might include letting vegetation grow taller along a stream, pumping septic tanks, or conducting soil tests before fertilizing lawns. The actions should tie directly back to the goals of the watershed plan because one of the goals of your information/education program will be to help implement the watershed plan. In addition, your message should be clear, specific, and tied directly to something the target audience values, such as:

- *Money savings*
- *Time savings*
- *Convenience*
- *Health improvements*
- *Efficiency*
- *Enhancing public values*
- *Improving ecosystem function*
- *Enhancing quality of life and environmental amenities*
- *Economic development benefits*

Storm Drain Stencil



Step 4: Package the Message

Now it is time to determine the best package or format for the message for eventual delivery to the target audience. The information you collected in Step 2 while researching the audience will help to determine the most appropriate format. When selecting your message format, think about where the target audience gets its information. A farming community might respond more positively to door-to-door visits or articles in farm publications than to an Internet and e-mail campaign.

Work with the Media

If your message needs to be understood and embraced by the public, it should be covered by the mass media. The media can be a very cost-effective and efficient way to get your message delivered. Formats using the mass media can be broken down into two major categories—news coverage and advertising.

News coverage includes interviews, news stories, letters to the editor, and event coverage. Advertising includes the development of public service announcements (PSAs). Publicity generated from news coverage is dependent on the news organization, whereas you create radio, TV, and newspaper advertising yourself. In many cases, the advertising you do can be leveraged later into news coverage. For example, one state bought informational ads on agriculture-related water quality issues from a radio station and received as a benefit some free news coverage of the issues during the year.

Develop Effective Print Materials

By far the most popular format for outreach campaigns is print. Printed materials include fact sheets, brochures, flyers, booklets, posters, bus placards, billboards, and doorknob hangers. These materials can be created easily, and the target audience can refer to them repeatedly. The Texas Commission on Environmental Quality (TCEQ) launched a nonpoint source outreach campaign in 2001 that targeted watersheds with water quality problems where the causes were known. In watersheds where pet waste was identified as contributing to these problems, TCEQ developed a full-color billboard display of a dog with the message, "Please pick up my poop". The billboards served as prompts to encourage behavior change. For more information, visit www.tceq.state.tx.us/assistance/education/nps.html .

Hold Events

Also, consider using activities to spread your message. A watershed event can be one of the most energizing formats for distributing messages targeted at awareness, education, or direct action. A community event plays into the desire of audience members to belong to a group and have shared goals and visions for the community. In urban areas, where knowing your neighbors and other members of your community is the exception rather than the rule, community events can help to strengthen the fabric of the community by creating and enhancing community relationships, building trust, and improving the relationships between government agencies and the public. In addition, if such events are done well, they are just plain fun.

Leverage Resources

If resources are limited and the message is fairly focused, try to piggyback onto an existing event that involves the target audience. Trade shows and other events for farmers, developers, boaters, fishers, the automobile industry, and other groups can often be accessed with a little research and a few phone calls. As in all outreach, you cannot deliver a message to the target audience if you do not have access to it. Approaches for generating interest and attention are limited only by your creativity. Watershed groups have used bands, balloons, face painting, mascots, interactive displays, video games, giveaways, clowns, jugglers, and celebrities to draw crowds. You can also increase the exposure of your event by inviting local TV and radio stations to cover it.

Step 5: Distribute the Message

Once the message has been packaged in the desired format, you can proceed with distribution. Fortunately, you have already considered distribution mechanisms somewhat while researching the target audience and selecting a format. Common means of distribution are by direct mail, door-to-door, by phone, through targeted businesses, during presentations, etc…."

M. PROVIDE ANY OTHER ANALYSES OR INFORMATION SPECIFIED IN THE WQMP (EXAMPLE: DISCUSSION OF FUNDING AND MAINTENANCE OF EFFORT OVER TIME) (*OAR 340-042-0080 (3)(a) (E) and OAR 340-042-0080 (3) (b)*)

What information should be provided?
If DEQ identifies any additional requirements such as *any other analyses or information* for DMAs in the WQMP, these requirements must be addressed in the DMA's TMDL Implementation Plan.

Why should this be included?
Oregon's TMDL rule states: "*Provide any other analyses or information specified in the WQMP.* Moreover, *"For sources subject to permit requirements in ORS 468B.050, wasteload allocations, and other management strategies will be incorporated into permit requirements."*

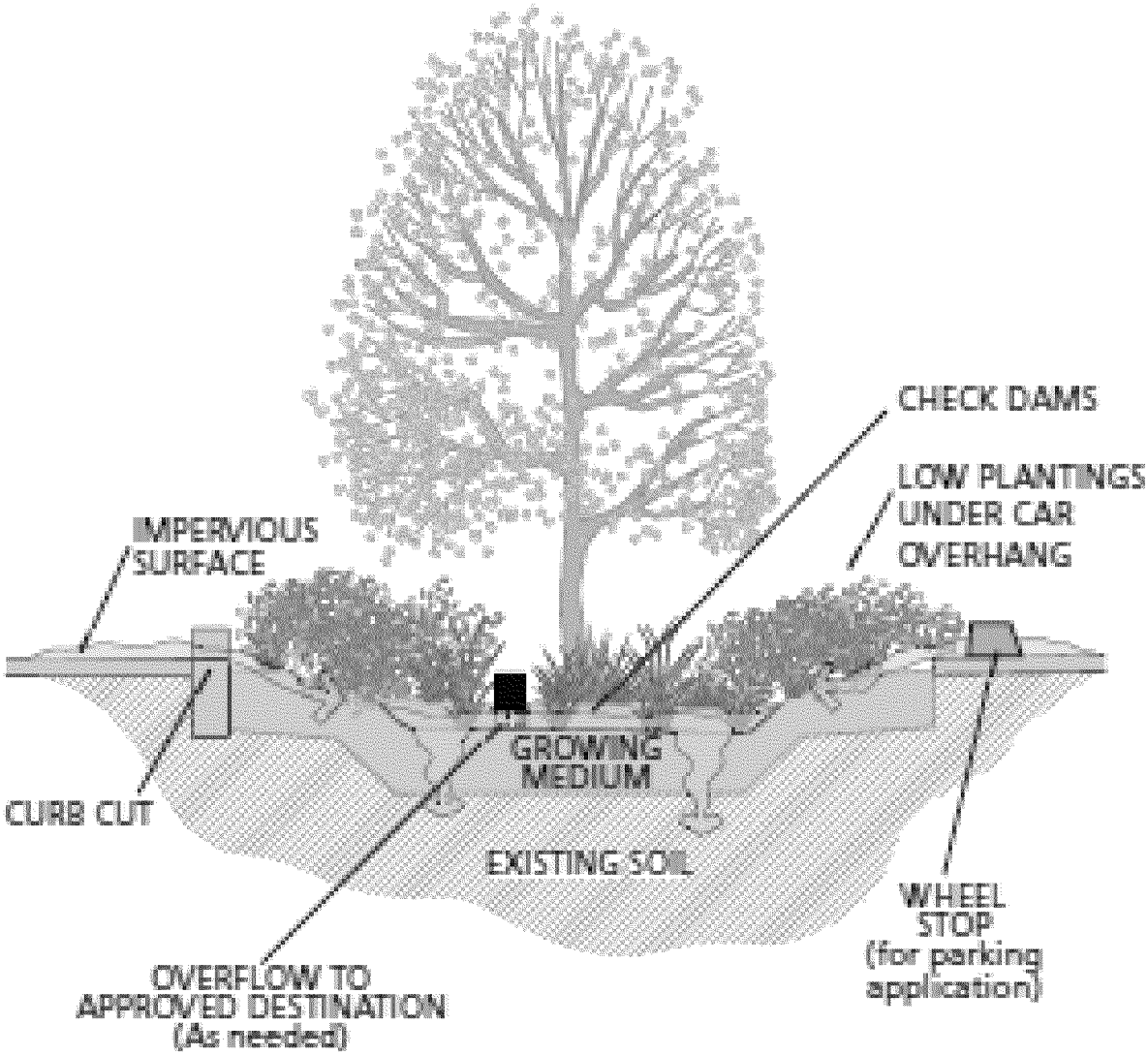
Where can this information be found?
The TMDL WQMP will identify the needed additional information needed.

For example, the Willamette TMDL WQMP requires that DMAs:

1. *"Include citation and brief descriptions in the implementation plan of legal authorities used to carry out the management strategies. For example, cite and describe the ordinances that prohibit illegal dumping to the storm drainage system, require erosion control for grading projects, etc.*

2. *If located along the mainstem Willamette River from river mile 50 downstream to the confluence with the Columbia River, address cold-water refugia in the implementation plan. This would be accomplished by identifying these areas and exploring opportunities to restore or enhance these areas whenever feasible. The results of this effort should be summarized in the plan."*

Vegetated Swales (Bioswales, Grassy Swales) From City of Portland Factsheet
http://www.portlandonline.com/bes/index.cfm?c=31870&a=127473



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GUIDANCE FOR TMDL IMPLEMENTATION PLAN DEVELOPMENT FOR URBAN/RURAL RESIDENTIAL LAND USES WITHIN THE COASTAL ZONE MANAGEMENT AREA

September 13, 2011

APPENDIXES

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APPENDIX A

Coastal Zone Management Area Boundary DEQ Basin Coordinators (July 2010)

BASIN OR WATERSHED	BASIN CONTACT	TELEPHONE NUMBER AND EMAIL
Mid Coast	David Waltz	(541) 687-7345 Eugene; Waltz.David@deq.state.or.us
North Coast/Lower Columbia (Tillamook)	Bruce Apple	(503) 842-3038 Tillamook; apple.bruce@deq.state.or.us
North Coast/Lower Columbia (Tillamook)	York Johnson	(503) 322-2222 Tillamook; johnson.york@deq.state.or.us
Rogue Basin	Bill Meyers	(541) 776-6272 Medford; meyers.bill@deq.state.or.us
South Coast Basin	Pam Blake	(541) 269-2721, x227 Coos Bay; blake.pam@deq.state.or.us
Umpqua Basin	David Waltz	(541) 687-7345 Eugene; Waltz.David@deq.state.or.us

APPENDIX B

EPA's Basic Components of a Watershed Plan.

Key Watershed Planning Components with Nine Key NPS Elements
Element 1
a. Include the geographic extent of the watershed covered by the plan.
b. Identify the measurable water quality goals, including the appropriate water quality standards and designated uses.
c. Identify the causes and sources or groups of similar sources that need to be controlled to achieve the water quality standards.
d. Break down the sources to the subcategory level.
e. Estimate the pollutant loads entering the waterbody.
Element 2
Determine the pollutant load reductions needed to meet the water quality goals.
Element 3
a. Identify management measures need to be implemented to achieve the load reductions.
b. Identify critical areas in which management measures are needed.
Element 4
a. Estimate the costs to implement the plan, including management measures, administration, information/education activities, and monitoring.
b. Identify the sources and amounts of financial and technical assistance and associated authorities available to implement the management measures.
Element 5
Prepare an information/education component that identifies the education and outreach activities needed for implementing the watershed management plan.
Element 6
Develop a schedule for implementing the plan.
Element 7
Develop interim, measurable milestones for determining whether management measures are being implemented.
Element 8
Develop a set of criteria to determine whether loading reductions are being achieved and progress is being made toward attaining (or maintaining) water quality goals, and specify what measures will be taken if progress has not been demonstrated.

Element 9
a. Develop a monitoring component to determine whether the plan is being implemented appropriately and whether progress toward attainment or maintenance of water quality goals is being achieved.
b. Develop an evaluation framework.

APPENDIX C

Coastal Zone Management Area Counties, Cities, and Unincorporated Areas[3]

COASTAL ZONE MANAGEMENT AREA COUNTIES, CITIES, AND UNINCORPORATED AREAS	YEAR 2009 POPULATION		COASTAL ZONE MANAGEMENT AREA COUNTIES, CITIES, AND UNINCORPORATED AREAS	YEAR 2009 POPULATION
BENTON[4]	**86,725**		Oakland	945
Unincorporated	18,277		Reedsport	4,300
CLATSOP[5]	**37,840**		Riddle	1,030
Astoria	10,250		Roseburg	21,355
Cannon Beach	1,690		Sutherlin	8,085
Gearhart	1,440		Winston	5,925
Hammond: Merged with Warrenton in 1991			Yoncalla	1,115
Seaside	6,480		Unincorporated	54,970
Warrenton	4,785		**JACKSON**	**207,010**
Unincorporated	13,195		Ashland	21,505
COLUMBIA	**48,410**		Butte Falls	445
Vernonia	2,370		Central Point	17,165
Unincorporated	21,445		Eagle Point	8,790
COOS	**63,065**		Gold Hill	1,080
Bandon	3,295		Jacksonville	2,665
Coos Bay	16,670		Medford	77,240
Coquille	4,205		Phoenix	4,855
Lakeside	1,560		Rogue River	2,090
Myrtle Point	2,550		Shady Cove	2,865
North Bend	9,855		Talent	6,680
Powers	755		Unincorporated	61,630
Unincorporated	24,175		**JOSEPHINE**	**83,665**
CURRY	**21,340**		Cave Junction	1,750
Brookings	6,470		Grants Pass	33,225
Gold Beach	2,140		Unincorporated	48,690
Port Orford	1,285		**KLAMATH**	**66,350**
Unincorporated	11,445		Unincorporated	42,180
DOUGLAS	**103,395**		**LANE**	**347,690**
Canyonville	1,705		Coburg	1,080
Drain	1,090		Cottage Grove	9,485
Elkton	255		Creswell	4,790
Glendale	955		Dunes City	1,360
Myrtle Creek	3,665		Florence	9,580

3 Portland State University, Population research Center, 2009 Oregon Population Report & Tables.

4 The counties highlighted in orange color are only partially included within the Coastal Zone Management Area and include no towns and may include only a few or no rural residential areas.

5 Population figures for county and incorporated areas include the whole county, not just that portion included in the Coastal Zone Management Area.

			Unincorporated	90,650

Coastal Zone Management Area Counties, Cities, and Unincorporated Areas (Cont.)

COASTAL ZONE MANAGEMENT AREA Counties, Cities, And Unincorporated Areas	Year 2009 Population		COASTAL ZONE MANAGEMENT AREA Counties, Cities, And Unincorporated Areas	Year 2009 Population
LINCOLN	**44,700**		**TILLAMOOK**	**26,130**
Depoe Bay	1,420		Bay City	1,285
Lincoln City	7,930		Garibaldi	895
Newport	10,600		Manzanita	735
Siletz	1,190		Nehalem	260
Toledo	3,645		Tillamook	4,710
Waldport	2,145		Rockaway Beach	1,380
Yachats	815		Wheeler	460
Unincorporated	16,955		Unincorporated	16,405
POLK	**68,785**		**WASHINGTON**	**527,140**
Unincorporated	10,307		Unincorporated	218,780
			YAMHILL	**95,250**
			Unincorporated	18,355

APPENDIX D

EPA AND NOAA May 12, 2010 Letter To Oregon on How to Receive Full Approval of Coastal Nonpoint Program

U.S. Department of Commerce
National Oceanic and Atmospheric Administration

U.S. Environmental Protection Agency

MAY 12 2010

Neil Mullane
Administrator
Water Quality Division
Department of Environmental Quality
811 SW Sixth Avenue
Portland, Oregon 97204

Bob Bailey
Administrator
Coastal Division
Department of Land, Conservation and Development
635 Capitol Street, NE, Suite 150
Salem, Oregon 97301

Dear Mr. Mullane and Mr. Bailey:

The Environmental Protection Agency (EPA) and National Oceanic and Atmospheric Administration (NOAA) have been working closely with you and your staff to address the remaining conditions on Oregon's Coastal Nonpoint Pollution Control Program (Coastal Nonpoint Program). We are very pleased with the progress that has been made. Over the past several months, we have had several meetings and conversations to discuss Oregon's October 29, 2009 draft approach to receive full approval of its Coastal Nonpoint Program the state shared with us in January. We would like to take this opportunity to formally follow up on the state's proposal and clarify what EPA and NOAA would need from the state before we are able to consider fully approving Oregon's Coastal Nonpoint Program.

We are highly supportive of Option #1, the prescriptive TMDL approach, extended to address all three outstanding forestry issues, for meeting the additional management measures for forestry, as well as the two strategies you laid out for satisfying the new development and onsite disposal system conditions. We believe these approaches could enable the state to receive full approval of its Coastal Nonpoint Program. However, additional clarification and details are needed before we can make a final decision.

The enclosed attachment lists the information Oregon must provide and timeline for doing so before EPA and NOAA would be able to approve Oregon's program. We recognize that some of these items may be challenging and require time to complete. EPA and NOAA developed the timeline in consultation with state staff to ensure due dates were reasonable yet keep the process moving forward. If sufficient progress is not being made, EPA and NOAA may disapprove Oregon's program and withhold a portion of the state's Clean Water Act Section 319 and Coastal Zone Management Act Section 306 funding pursuant to 16 U.S.C. § 1455b(c).

After careful consideration, EPA and NOAA no longer believe pursuing a change to the Forest Practices Act (Option #2) is a viable option at this time. It would take years for the rule change process to play out and there is no certainty the resource-intensive effort would ultimately result in substantive rule changes to address NOAA and EPA's remaining forestry concerns: adequate protection of riparian and landslide-prone areas, and management/maintenance of forestry roads impairing water quality, particularly legacy roads.

As always, EPA and NOAA look forward to continuing to work with you to address the remaining conditions on your Coastal Nonpoint Program. Please let us know if there is any specific assistance you need. For example, we would be happy to provide existing reports and data, and/or comparable examples on how the outstanding additional management measures for forestry can be met. NOAA's National Marine Fisheries Service could also provide information on forest management strategies that will help protect aquatic species, including salmon.

We encourage you to share proposed riparian, landslide, and legacy road best management practices (BMPs) as well as drafts of the onsite disposal system rules and TMDL Implementation Guidance with us to review. Early NOAA and EPA feedback will help ensure the BMPs, onsite rules, and TMDL Implementation Guidance will help to protect water quality and aquatic resources and satisfy the conditions on the state's Coastal Nonpoint Program.

Please contact either Dave Powers of EPA Region 10 at (503) 326-5874 or Allison Castellan of NOAA at (301) 563-1125 if you have questions.

Sincerely,

John King, Chief
Coastal Programs Division
Office of Ocean and Coastal Resource Management
National Oceanic and Atmospheric Administration

Mike Bussell, Director
Office of Water and Watersheds
Environmental Protection Agency, Region 10

Enclosure

cc: Don Yon, OR DEQ
Amanda Punton, OR DLCD
Eugene Foster, OR DEQ HQ
Don Waye, EPA HQ
Dave Powers, EPA R10
Allison Castellan, NOAA

Attachment

What NOAA and EPA Need from Oregon for Coastal Nonpoint Program Approval

OSDS:

1. Adopt new rules requiring regular inspections for OSDS. Inspecting the systems at time of property transfer by trained/certified inspectors as laid out in Oregon's October 29, 2009 draft strategy is sufficient. Please provide NOAA/EPA with a copy of the draft rules to review to ensure the final rules will meet Coastal Nonpoint Program requirements.

Timeline:

- **November 30, 2010:** Policy Option Package for Rules Development completed.
- **January 2011 through June 2011:** Request funding from the 2011 Oregon Legislature to support time-of-sale inspections for OSDS.
- **June through December 2012:** Provide draft(s) of rule language to NOAA and EPA for review/comment.
- **December 31, 2012:** Rule development completed.
- **January 31, 2013:** Submit new rules to NOAA and EPA for review/approval.
- **March 2013:** Rule implementation and inspections begin.

New Development:

1. Complete TMDL Implementation Guidelines for the Coastal Nonpoint Program management area that incorporate the new development management measure requirements or practices consistent with the new development measure. Please provide NOAA and EPA with drafts of the guidance to review to ensure the final product will meet Coastal Nonpoint Program requirements.

2. Submit a strategy and schedule for completing and updating TMDL Implementation Plans within the Coastal Nonpoint Program management area to be consistent with the new TMDL Implementation Guidance.

Timeline:

- **June 30, 2010:** Initial draft guidance document completed and provided to NOAA and EPA for review and comment.
- **December 31, 2010:** Final draft guidance document completed and provide to NOAA and EPA for review and comment.
- **March 31, 2011:** Public review of final draft guidance document completed.
- **June 30, 2011:** Final guidance document released and submitted to NOAA and EPA, along with strategy and schedule for updating TMDL Implementation Plans.
- **June/July 2011:** Workshops for Designated Management Agencies begins.

Additional Management Measures for Forestry:

1. Commit to the prescriptive TMDL, Implementation Plan, and "safe harbor" BMP approach ("Option 1" under the State's proposal) that will satisfy the additional management measures for forestry condition, specifically addressing riparian and landslide-prone areas, and road issues.

2. Provide a legal opinion from the Oregon Attorney General's Office that clearly concludes Oregon DEQ has the authority to prevent nonpoint source pollution and require implementation of the additional management measures for forestry. Specifically, under the state's current proposal, the legal opinion must conclude that DEQ has the authority to enforce TMDLs, including "safe harbor" BMPs, with regard to riparian buffers, landslide-prone areas, and legacy roads.

3. Provide a more detailed description of the new prescriptive TMDL process. This revised description should:
   a. Clarify the mechanism DEQ plans on using to require prescriptive, "safe harbor" BMPs. Will the BMPs (or possibly a menu of "safe harbor" BMPs to select from) be placed in the TMDLs themselves or only included in the TMDL Implementation Plans? Does DEQ's enforcement authority apply to both TMDLs and Implementation Plans?

   b. Briefly describe how the prescriptive TMDL approach will address NOAA and EPA's concerns with landslide prone areas and road density and maintenance, particularly on "legacy roads." During our January 14th meeting/conference call, the state discussed the potential use of DOGAMI LIDAR coverages, Relative Bed Stability, and GRAIP methodologies to assess, target, and address landslide prone areas and road issues in support of the new prescriptive TMDL process. DEQ should briefly describe these methodologies and/or others and how they will be used in the new TMDL process. The description should include how these tools will help target and, where needed, develop "safe harbor" BMPs.

   c. Provide a few examples of the types of "safe harbor" BMPs Oregon would use to address our concerns about adequate protection of riparian and landslide-prone areas and management/maintenance of forestry roads, specifically legacy roads, and meet load allocations and surrogate targets. We recognize that the BMPs could vary from parcel to parcel based on the site conditions but we need a reasonable assurance that the types of "safe harbor" BMPs Oregon is developing link to, and would meet, water quality standards and protect beneficial uses. For example, requirements for restricting harvest intensities and methods on high risk landslide prone areas should be described along with the triggers or thresholds for their application. We recommend providing comparable examples of harvest restrictions on high risk landslide prone areas such as those applied under the Washington Forests and Fish rules as well as the harvest restrictions under the Oregon Forest Practices Act rules related to high risk landslide areas above roads and buildings. The Northwest Forest Plan also includes measures for landslide prone areas that DEQ could consider.

   d. Briefly describe DEQ's approval/disapproval process for TMDL Implementation Plans. To address the additional management measures for forestry condition, decisions to approve or disapprove need to be based on the plan's ability to meet load allocations or surrogate targets. If DEQ's decisions are based on a basin-specific rule adopted by BOF, then such rule must have the ability to meet load allocations or surrogate targets.

4. Provide a schedule for developing new prescriptive TMDLs and safe harbor BMPs and updating existing TMDLs and Implementation Plans within the 6217 boundary following the new prescriptive TMDL process.

5. Complete and submit to EPA and NOAA a prescriptive TMDL that includes safe harbor BMPs and a TMDL Implementation Plan for the Mid-Coast basins and that addresses the outstanding additional management measures for forestry condition.

Timeline:

- **June 30, 2010:** Submit a legal opinion from Oregon's Attorney General's Office (Item 2).
- **September 30, 2010:** Provide commitment that Oregon will pursue prescriptive TMDL process for addressing the additional management measures for forestry condition **January 31, 2011:** Provide additional detail on the prescriptive TMDL process (Item 3).
- **March 31, 2011:** Provide a schedule for implementing the prescriptive TMDL approach throughout the Coastal Nonpoint Program management area which includes a timeline for developing new TMDLs as well as updating existing TMDLs.
- **June 30, 2012:** Complete and submit prescriptive TMDLs and TMDL Implementation Plans for Mid-Coast basins.

APPENDIX E

Department of Environmental Quality
Division 42
Total Maximum Daily Loads (TMDLS)

340-042-0025

Policy, Purpose and Effect

(1) The public policy of the State of Oregon is to protect, maintain, and improve the quality of waters of the state for beneficial uses and to provide for prevention, abatement, and control of water pollution. To achieve and maintain water quality standards, the Environmental Quality Commission may impose limitations and controls including Total Maximum Daily Loads (TMDLs), wasteload allocations for point sources, and load allocations for nonpoint sources.

(2) The policy of the Environmental Quality Commission is to have the Department of Environmental Quality establish TMDLs, including wasteload and load allocations, and have responsible sources meet these allocations through compliance with discharge permits or other strategies developed in sector or source-specific implementation plans. These measures must achieve and maintain water quality standards and restore waters of the state that are water quality limited.

(3) These rules establish procedures for developing, issuing and implementing TMDLs as required by the Federal Water Pollution Control Act Section 303(d) (33 USC Section 1313(d)) and authorized by Oregon statutes to ensure that state water quality standards are met and beneficial uses protected.

(4) The Department of Environmental Quality will review any changes to Federal Water Pollution Control Act Section 303(d) or implementing regulations in 40 CFR Part 130 promulgated after the effective date of these rules. The Department may subsequently recommend that the Environmental Quality Commission amend, repeal, or adopt new rules. Rules adopted by the Commission remain in effect until the Commission takes action on the recommendations.

340-042-0030

Definitions

In addition to the definitions provided in ORS 468.005, 468B.005, OAR 340-041-0006 and 340-045-0010, unless otherwise required by context, the following definitions apply to OAR chapter 340, division 42.

(1) "Background Sources" include all sources of pollution or pollutants not originating from human activities. In the context of a TMDL, background sources may also include anthropogenic sources of a pollutant that the Department or another Oregon state agency does not have authority to regulate, such as pollutants emanating from

another state, tribal lands or sources otherwise beyond the jurisdiction of the state.

(2) "Designated Management Agency (DMA)" means a federal, state, or local governmental agency that has legal authority over a sector or source contributing pollutants, and is identified as such by the Department of Environmental Quality in a TMDL.

(3) "Director" means the Director of the Department of Environmental Quality or the Director's authorized designee.

(4) "Hydrologic Unit Code (HUC)" means a multi-scale numeric code used by the U.S. Geological Survey to classify major areas of surface drainage in the United States. The code includes fields for geographic regions, geographic sub regions, major river basins, and subbasins. The third field of the code generally corresponds to the major river basins named in OAR chapter 340, division 41. The fourth field generally corresponds to the subbasins typically addressed in TMDLs.

(5) "Local Advisory Group" means a group of people with experience and interest in a specific watershed or subbasin that is designated by the Department to provide local input during TMDL development.

(6) "Management Strategies" means measures to control the addition of pollutants to waters of the state and includes application of pollutant control practices, technologies, processes, siting criteria, operating methods, best management practices or other alternatives.

(7) "Performance Monitoring" means monitoring implementation of management strategies, including sector-specific and source-specific implementation plans, and resulting water quality changes.

(8) "Pollutant" has the meaning provided in the Federal Water Pollution Control Act Section 502 (33 USC Section 1362).

(9) "Reasonable Assurance" means a demonstration that a TMDL will be implemented by federal, state, or local governments or individuals through regulatory or voluntary actions including management strategies or other controls.

(10) "Sector" means a category or group of similar nonpoint source activities such as forestry, agriculture, recreation, urban development, or mining.

(11) "Sector-Specific Implementation Plan" or "Source-Specific Implementation Plan" in the context of a TMDL means a plan for implementing a Water Quality Management Plan for a specific sector or source not subject to permit requirements in ORS 486.050. The elements of an implementation plan are described in OAR 340-042-0080.

(12) "Source" means any process, practice, activity, or resulting condition that causes or may cause pollution or the introduction of pollutants to a waterbody.

(13) "Subbasin" means the designation in the fourth field of the U.S. Geological Survey Hydrologic Unit Code.

(14) "Surrogate Measures" means substitute methods or parameters used in a TMDL to represent pollutants.

(15) "Total Maximum Daily Load (TMDL)" means a written quantitative plan and analysis for attaining and maintaining water quality standards and includes the elements described in OAR 340-042-0040. These elements include a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet state water quality standards, allocations of portions of that amount to the pollutant sources or sectors, and a Water Quality Management Plan to achieve water quality standards.

(16) "Waterbody" means any surface waters of the state.

(17) "Water Quality Management Plan (WQMP)" means the element of a TMDL describing strategies to achieve allocations identified in the TMDL to attain water quality standards. The elements of a WQMP are described in OAR 340-042-0040(4)(l).

340-042-0040

Establishing Total Maximum Daily Loads (TMDLs)

(1) The Department will establish TMDLs for pollutants in waters of the state that are listed in accordance with the Federal Water Pollution Control Act Section 303(d) (33 USC Section 1313(d)).

(2) The Department will group stream segments and other waterbodies geographically by subbasin and develop TMDLs for those subbasins, unless it determines another approach is warranted.

(3) The Department will prioritize and schedule TMDLs for completion considering the following factors:

(a) Severity of the pollution,

(b) Uses of the water,

(c) Availability of resources to develop TMDLs,

(d) Specific judicial requirements, and

(e) Any other relevant information.

(4) A TMDL will include the following elements:

(a) Name and location. This element describes the geographic area for which the TMDL is developed and includes maps as appropriate.

(b) Pollutant identification. This element identifies the pollutants causing impairment of water quality that are addressed in the TMDL.

(c) Water quality standards and beneficial uses. This element identifies the beneficial uses in the basin and the relevant water quality standards, including specific basin standards established in OAR 340-041-0202 through 340-041-0975. The beneficial use that is most sensitive to impairment by the pollutant or pollutants addressed in the TMDL will be specified.

(d) Loading capacity. This element specifies the amount of a pollutant or pollutants that a waterbody can receive and still meet water quality standards. The TMDL will be set at a level to ensure that loading capacity is not exceeded. Flow assumptions used in the TMDL will be specified.

(e) Excess load. This element evaluates, to the extent existing data allow, the difference between the actual pollutant load in a waterbody and the loading capacity of that waterbody.

(f) Sources or source categories. This element identifies the pollutant sources and estimates, to the extent existing data allow, the amount of actual pollutant loading from these sources. The TMDL will establish wasteload allocations and load allocations for these sources. The Department will use available information and analyses to identify and document sources.

(g) Wasteload allocations. This element determines the portions of the receiving water's loading capacity that are allocated to existing point sources of pollution, including all point source discharges regulated under the Federal Water Pollution Control Act Section 402 (33 USC Section 1342).

(h) Load allocations. This element determines the portions of the receiving water's loading capacity that are allocated to existing nonpoint sources of pollution or to background sources. Load allocations are best estimates of loading, and may range from reasonably accurate estimates to gross allotments depending on the availability of data and appropriate techniques for predicting loading. Whenever reasonably feasible, natural background and anthropogenic nonpoint source loads will be distinguished from each other.

(i) Margin of safety. This element accounts for uncertainty related to the TMDL and, where feasible, quantifies uncertainties associated with estimating pollutant loads, modeling water quality, and monitoring water quality. The TMDL will explain how the margin of safety was derived and incorporated into the TMDL.

(j) Seasonal variation. This element accounts for seasonal variation and critical conditions in stream flow, sensitive beneficial uses, pollutant loading and water quality parameters so that water quality standards will be attained and maintained during all seasons of the year.

(k) Reserve capacity. This element is an allocation for increases in pollutant loads from future growth and new or expanded sources. The TMDL may allocate no reserve capacity and explain that decision.

(l) Water quality management plan (WQMP). This element provides the framework of management strategies to attain and maintain water quality standards. The framework is designed to work in conjunction with detailed plans and analyses provided in sector-specific or source-specific implementation plans. The WQMP will address the following:

(A) Condition assessment and problem description.

(B) Goals and objectives.

(C) Proposed management strategies designed to meet the wasteload allocations and load allocations in the TMDL. This will include a categorization of sources and a description of the management strategies proposed for each source category.

(D) Timeline for implementing management strategies including:

(i) Schedule for revising permits,

(ii) Schedule for achieving appropriate incremental and measurable water quality targets,

(iii) Schedule for implementing control actions, and

(iv) Schedule for completing other measurable milestones.

(E) Explanation of how implementing the management strategies will result in attainment of water quality standards.

(F) Timeline for attainment of water quality standards.

(G) Identification of persons, including Designated Management Agencies (DMAs), responsible for implementing the management strategies and developing and revising sector-specific or source-specific implementation plans.

(H) Identification of sector-specific or source-specific implementation plans that are available at the time the TMDL is issued.

(I) Schedule for preparation and submission of sector-specific or source-specific implementation plans by responsible persons, including DMAs, and processes that trigger revisions to these implementation plans.

(J) Description of reasonable assurance that management strategies and sector-specific or source-specific implementation plans will be carried out through regulatory or voluntary actions.

(K) Plan to monitor and evaluate progress toward achieving TMDL allocations and water quality standards including:

(i) Identification of persons responsible for monitoring, and

(ii) Plan and schedule for reviewing monitoring information and revising the TMDL.

(L) Plan for public involvement in implementing management strategies.

(M) Description of planned efforts to maintain management strategies over time.

(N) General discussion of costs and funding for implementing management strategies. Sector-specific or source-specific implementation plans may provide more detailed analyses of costs and funding for specific management strategies.

(O) Citation of legal authorities relating to implementation of management strategies.

(5) To determine allocations for sources identified in the TMDL, the Department:

(a) Will use water quality data analyses, which may include statistical analyses or mathematical models.

(b) May use surrogate measures to estimate allocations for pollutants addressed in the

TMDL. The Department may use one or more surrogate measures for a pollutant that is difficult to measure or highly variable. A surrogate measure will be closely related to the pollutant, and may be easier to monitor and track. The TMDL will establish the correlation between the surrogate measure and pollutant.

(6) The Department will distribute wasteload and load allocations among identified sources and in doing so, may consider the following factors:

(a) Contributions from sources;

(b) Costs of implementing measures;

(c) Ease of implementation;

(d) Timelines for attainment of water quality standards;

(e) Environmental impacts of allocations;

(f) Unintended consequences;

(g) Reasonable assurances of implementation; and

(h) Any other relevant factor.

(7) After issuing the TMDL, the Department may revise the loading capacity and allocations to accommodate changed needs or new information. In making these revisions, the Department will comply with the public notice provisions in OAR 340-042-0050(2) and procedures for issuing TMDL orders in OAR 340-042-0060.

(8) If the Environmental Protection Agency establishes a TMDL addressing waterbodies in Oregon, the Department may prepare a WQMP to implement that TMDL.

340-042-0050

Public Participation

(1) The Department will establish a local advisory group or identify an existing group or forum to assist in developing a TMDL.

(2) The Department will provide an opportunity for persons to review and comment on a draft TMDL and on proposals to revise loading capacity or allocations in a TMDL as follows:

(a) The Department will maintain a mailing list for each TMDL.

(b) The Department will provide notice and an opportunity for public comment on a proposed TMDL or revision to loading capacity or allocations in a TMDL. The public comment period will generally be 60 days.

(c) The Department will respond to public comments received during the public comment period and will prepare a written summary of responses.

340-042-0060

Issuing a Total Maximum Daily Load

(1) The Director will issue a TMDL as an order. If the Environmental Protection Agency establishes a TMDL addressing waterbodies in Oregon, the Director may issue as an order a WQMP to implement that TMDL.

(2) The order will be effective and final on the date signed by the Director.

(3) Following issuance, the Department will submit the TMDL to the Environmental Protection Agency.

(4) Within 20 business days after the Director signs the order, the Department will notify all affected NPDES permittees, nonpoint source DMAs identified in the TMDL and persons who provided formal public comment on the draft TMDL that the order has been issued and the summary of responses to comments is available.

340-042-0070

Requesting Reconsideration or Appealing a Total Maximum Daily Load

(1) Any person who participated in establishing a TMDL, including those who submitted comments and any other person entitled to seek judicial review of an order issuing a TMDL may request reconsideration by the Director in accordance with OAR 137-004-0080.

(2) A person may file a petition for judicial review of a final TMDL order as allowed by ORS 183.484.

340-042-0080

Implementing a Total Maximum Daily Load

(1) Management strategies identified in a WQMP to achieve wasteload and load allocations in a TMDL will be implemented through water quality permits for those sources subject to permit requirements in ORS 468B.050 and through sector-specific or source-specific implementation plans for other sources. WQMPs will identify the sector and source-specific implementation plans required and the persons, including DMAs, responsible for developing and revising those plans.

(2) The Oregon Department of Forestry will develop and enforce implementation plans addressing state and private forestry sources as authorized by ORS 527.610 through 527.992 and according to OAR chapter 629, divisions 600 through 665. The Oregon Department of Agriculture will develop implementation plans for agricultural activities and soil erosion and enforce associated rules as authorized by ORS 568.900 through 568.933 and according to OAR chapter 603, divisions 90 and 95.

(3) Persons, including DMAs other than the Oregon Department of Forestry or the Oregon Department of Agriculture, identified in a WQMP as responsible for developing and revising sector-specific or source-specific implementation plans

must:

(a) Prepare an implementation plan and submit the plan to the Department for review and approval according to the schedule specified in the WQMP. The implementation plan must:

(A) Identify the management strategies the DMA or other responsible person will use to achieve load allocations and reduce pollutant loading;

(B) Provide a timeline for implementing management strategies and a schedule for completing measurable milestones;

(C) Provide for performance monitoring with a plan for periodic review and revision of the implementation plan;

(D) To the extent required by ORS 197.180 and OAR chapter 340, division 18, provide evidence of compliance with applicable statewide land use requirements; and

(E) Provide any other analyses or information specified in the WQMP.

(b) Implement and revise the plan as needed.

(4) For sources subject to permit requirements in ORS 468B.050, wasteload allocations, and other management strategies will be incorporated into permit requirements.

Stat. Auth.: ORS 468.020, ORS 468B.020, ORS 468B.030, ORS 468B.035 & ORS 468B.110
Stats. Implemented: ORS 468B.020, ORS 468B.110
Hist.: DEQ 18-2002, f. & cert. ef. 12-20-02

APPENDIX F

TMDLs and 303(d) Listed Pollutants by Waterbody for Urban/Rural Residential DMAs within the Coastal Zone Management Area

TMDL	WATERBODY	303 (d) LISTED POLLUTANTS (2002 and 2004 LISTS)	TMDL PARAMETERS	USEPA APPROVAL DATES
North Coast	Nestucca Bay Watershed (Wilson-Trask-Nestucca Subbasins)	Aquatic Weeds or Algae, Dissolved Oxygen, Fecal Coliform, Iron, Sedimentation, and Temperature	Fecal Coliform, Sedimentation and Temperature	TMDL for Fecal Coliform, Sedimentation and Temperature Approved by EPA 05/13/2002
North Coast	North Coast Subbasins (Lower Columbia-Youngs, Lower Columbia-Clatskanie, Necanicum, and Nehalem Subbasins)	Chlorine, Chromium, Copper, Dissolved Oxygen, E-coli, Fecal Coliform, Iron, Manganese, Temperature and Zinc	Bacteria and Temperature	TMDL for Bacteria and Temperature Approved by EPA 08/20/2003
North Coast	Tillamook Bay Watershed	E-coli, Fecal Coliform and Temperature	Fecal Coliform and Temperature	TMDL for Fecal Coliform and Temperature Approved by EPA 07/31/2001
Mid Coast	Alsea River	Dissolved Oxygen, Fecal Coliform, E-Coli, Temperature	Fecal Coliform, E-Coli, Temperature	TMDL Started w/ Completion in 2012.
Mid Coast	Clear Lake	Phosphorus	Phosphorus	TMDL for Phosphorus Approved by EPA 12/08/1992

TMDLs and 303(d) Listed Pollutants by Waterbody for Urban/Rural Residential DMAs within the Coastal Zone Management Area (Cont.)

TMDL	WATERBODY	303 (d) LISTED POLLUTANTS (2002 and 2004 LISTS)	TMDL PARAMETERS	USEPA APPROVAL DATES
Mid Coast	Siletz-Yaquina	Dissolved Oxygen, Fecal Coliform, Temperature	Fecal Coliform, Temperature	TMDL Started w/ Completion in 2012.
Mid Coast	Siltcoos River, Siltcoos and Tahkenitch Lakes	Temperature	Temperature	TMDL Started w/ Completion in 2012.
Mid Coast	Siuslaw	Fecal Coliform, Temperature	Fecal Coliform, Temperature	TMDL Started w/ Completion in 2012.
Mid Coast	Tenmile Watershed	Fecal Coliform and Temperature	Sedimentation	TMDL for Sedimentation Approved by EPA 05/31/2007
South Coast	Chetco Subbasin	Dissolved Oxygen, Fecal Coliform, pH, Temperature		TMDL Started w/ Completion in 2012
South Coast	Coos Subbasin	Dissolved Oxygen, Fecal Coliform, Iron, Manganese, and Temperature		TMDL Started w/ Completion in 2012
South Coast	Coquille River	Chlorophyll a, Dissolved Oxygen, Fecal Coliform, Iron, and Temperature	Dissolved Oxygen	Point Source Only TMDL for Dissolved Oxygen Approved by EPA 07/03/1996
			Dissolved Oxygen and Temperature	TMDL Update in Progress w/ Completion in 2011
South Coast	Garrison Lake	Phosphorus	Phosphorus	Point Source Only TMDL for Phosphorus Approved by EPA 12/08/1992

TMDLs and 303(d) Listed Pollutants by Waterbody for Urban/Rural Residential DMAs within the Coastal Zone Management Area (Cont.)

TMDL	WATERBODY	303 (d) LISTED POLLUTANTS (2002 and 2004 LISTS)	TMDL PARAMETERS	USEPA APPROVAL DATES
South Coast	Upper South Fork Coquille River	Dissolved Oxygen and Temperature	Temperature	TMDL for Temperature Approved by EPA 03/23/2001
Umpqua	Little River Watershed (North Umpqua Subbasin)	pH, Sedimentation, and Temperature	pH, Sediment, and Temperature	TMDL for pH, Sediment, and Temperature Approved by EPA 01/29/2002
Umpqua	Umpqua River Basin	Beryllium, Copper, Iron, Lead, Manganese, Dissolved Oxygen, E-Coli, Fecal Coliform, Iron, pH, Temperature	Algae/Aquatic Weeds, Biological Criteria, Dissolved Oxygen, Fecal Coliform, pH, and Temperature	TMDL for Algae/Aquatic Weeds, Biological Criteria, Dissolved Oxygen, Fecal Coliform, pH, and Temperature Approved by EPA 04/12/2007
Rogue	Applegate Subbasins	Biological Criteria, Dissolved Oxygen, Sedimentation, and Temperature	Biological Criteria, Sedimentation and Temperature	TMDL for Biological Criteria, Sedimentation and Temperature Approved by EPA 02/11/2004
Rogue	Bear Creek (Middle Rogue Subbasin)	Ammonia, BOD, Dissolved Oxygen, E-Coli, Fecal Coliform, Phosphorus, Sedimentation, Temperature	Ammonia, BOD, Phosphorus	TMDL for Ammonia, BOD, Phosphorus Approved by EPA 12/08/1992
			TMDL for Dissolved Oxygen, Fecal Coliform, Sedimentation Temperature	TMDL for Temperature, Dissolved Oxygen, Fecal Coliform, Sedimentation Temperature Approved by EPA 10/02/2007

TMDLs and 303(d) Listed Pollutants by Waterbody for Urban/Rural Residential DMAs within the Coastal Zone Management Area (Cont.)

TMDL	WATERBODY	303 (d) LISTED POLLUTANTS (2002 and 2004 LISTS)	TMDL PARAMETERS	USEPA APPROVAL DATES
Rogue	Lobster Creek Watershed (Lower Rogue Subbasin)	Temperature	Temperature	TMDL for Temperature Approved by EPA 06/13/2002
Rogue	Lower Sucker Creek Watershed (Illinois Subbasin)	Temperature	Temperature	TMDL for Temperature Approved by EPA 05/30/2002
Rogue	Rogue Basin (Includes all of Illinois Subbasin)	Dissolved Oxygen, E-Coli, Fecal Coliform, pH, and Temperature	E-Coli, Fecal Coliform, and Temperature	TMDL for E-Coli, Fecal Coliform, and Temperature Approved by EPA 12/29/2008
Rogue	Upper Sucker Creek / Grayback Watersheds (Illinois Subbasin)	Temperature	Temperature	TMDL for Temperature Approved by EPA 05/04/1999

APPENDIX G

Inventory of Water Resource Management Activities

The following questions are intended to help local governments identify things they are already doing that may help address some of the Water Quality Implementation Plan requirements.

PLANNING

1. Identify which part(s) of your Comprehensive Plan address water quality, non-point source pollution, stormwater, riparian zones, or water pollution control.

2. What steps has your jurisdiction taken to enact and/or comply with Statewide Land Use Planning Goals 5, 6, and 7?

3. What zoning ordinances and/or overlays has your jurisdiction enacted that relate to water quality? This may include, but is not limited to, ordinances that address any of the following:

- ☐ Erosion and/or sediment control requirements at construction sites
- ☐ Retention of vegetation and/or re-planting requirements at construction sites
- ☐ Impervious surfaces limitations for new development
- ☐ Development limitations in floodplains
- ☐ Septic system inspection and maintenance requirements
- ☐ Riparian area protections

4. Has your jurisdiction participated in any of the following planning efforts?

- ☐ Source Water Assessment
- ☐ Drinking Water Protection Plan
- ☐ Watershed Management Plan (may be in partnership with a local watershed council)
- ☐ Other--Please

Specify _____

STORMWATER

1. Does your jurisdiction have an NPDES municipal separate storm sewer system (MS4) permit?

2. Does your jurisdiction have any underground injection control (UIC) facilities (e.g., sumps)? If so, are they covered under a UIC general or individual permit?

3. Does your jurisdiction have any stormwater treatment facilities? If yes, what kind and how many?

4. Has your jurisdiction completed a stormwater management plan?

5. Has your jurisdiction's public works or parks department constructed any swales, detention or retention ponds/basins, or artificial wetlands for managing stormwater? If yes, please specify.

6. Does your jurisdiction encourage or require private developers to construct swales, detention ponds/basins, or artificial wetlands?

POLLUTION CONTROL

1. Does your jurisdiction have any voluntary or mandatory inspection or maintenance programs for onsite septic systems?

2. Does your jurisdiction have a program to detect illegal discharges into waterways?

3. Has your jurisdiction implemented any projects intended to help control nonpoint source pollution?

OUTREACH AND EDUCATION

1. What resources does your jurisdiction provide that encourages pet owners to "pick up" after their pets (waste bags, educational materials, dog parks in environmentally friendly areas)?

2. What guidance or training programs exist for municipal employees that address pollution prevention in regards to municipal sources, i.e. maintenance of vehicles, buildings, roads, parks and open space or the stormwater system?

3. Does your jurisdiction offer yard waste collection services and/or recycling programs?

REGIONAL COORDINATION

Which watershed councils, soil and water conservation districts (SWCDs), or other groups do you work with to address watershed restoration needs? Describe the types of cooperative efforts undertaken with them.

MONITORING

Does your jurisdiction monitor water quality (surface water, groundwater, or stormwater)? Has the data been analyzed?

APPENDIX H

Funding Sources List

State

Oregon DEQ - 319 Nonpoint Source Grants

Oregon DEQ administers the 319 program in Oregon. An annual Request For Proposals (RFPs) seeks proposals from government agencies, tribal nations, and nonprofit organizations to address nonpoint sources (NPS) of pollution affecting coastal, river, lake, drinking, and ground water resources of the state. In 2009, Oregon received about $1.5 million of federal grant dollars from EPA under Section 319(h) of the Clean Water Act.

Funding and oversight of selected proposals are administered by the DEQ Water Quality Program and all approved projects are contracted with the DEQ. DEQ identifies specific regional priorities for 319 Nonpoint Source Implementation Grant funds, which can be found at http://www.deq.state.or.us/wq/nonpoint/grants.htm.

An application form and information on the 319-grant program can be found at the 319 website. Typically, proposals are accepted in late fall to early winter. All projects must include non-federal matching funds of at least 40% of the project's total costs. To calculate the minimum required match, multiply the amount of 319 funds you are requesting for your project by two-thirds. Applicants are encouraged to investigate partnering opportunities with the Oregon Watershed Enhancement Board grant program: http://www.oregon.gov/OWEB/GRANTS/index.shtml

Applicants must contact their DEQ basin coordinator **(Appendix A)** with their project idea(s) prior to submitting a grant proposal. DEQ encourages DMAs considering applying for 319 funds to develop a strategy for implementation of the on-the-ground projects and cultivate the working relationships at various levels, including leveraging our funds. This aspect of the proposed workplan is considered in the review.

DEQ has identified TMDL development and implementation as the top priority for funding under the 319 Grant program. Project proposals submitted to DEQ should reflect the listed priorities. Project proposals will be evaluated and prioritized for funding based on how well the proposal addresses a DEQ geographic and programmatic priority DEQ Regional and Headquarter Managers will make the final recommendation to the DEQ Water Quality Division Administrator for submittal to EPA Region 10. Only projects that are ranked "high" by the DEQ Headquarters (HQ) and Regions will be funded.

Oregon DEQ - Clean Water State Revolving Fund

The Clean Water State Revolving Fund (CWSRF) Loan Program provides low-cost loans for the planning, design and construction of various water pollution control activities. Any public agency in Oregon is eligible for a CWSRF loan. Eligible public agencies include cities, counties, sanitary districts, soil & water conservation districts, irrigation districts and various special districts.

In its commitment to support the funding of TMDL implementation plans for stormwater, NPS, "green projects" such as green infrastructure (including LID), water or energy efficiency improvements, and other environmentally innovative activities. The DEQ Clean Water State Revolving Fund (CWSRF) loan program continues to evaluate both point source and nonpoint source projects on the merits of their water quality benefits rather than focusing heavily on compliance issues which in the past favored wastewater treatment projects.

The number of NPS and stormwater projects funded by the loan program continues to grow. From January 1, 2004 through December 31, 2009, the CWSRF Program has provided $29,144,419 towards stormwater and NPS water quality improvements.

The **"sponsorship option" loan**, which allows a water restoration project to be funded in conjunction with a traditional wastewater project - at a reduced interest rate -, continues to be available for public agencies. This loan is an excellent avenue to fund NPS and stormwater projects when the project can be paired with the needs of a municipality and then be paid over time with sewer revenues.

DEQ's **Local Community Loan Program** provides funds to a county or city to establish a "local loan" low-cost financial assistance to individual homeowners to repair or replace substandard and failing on-site systems.

The program is always open to new applications. Applicants must provide information on the project's benefits, environmental impact, and estimated cost. Applications are available at DEQ's CWSRF website: http://www.deq.state.or.us/wq/loans/loans.htm. Upon approval of all application documents, DEQ funds the project if sufficient loan monies are available. The program typically provides about $40 million annually. When loan monies are awarded, DEQ and the public agency negotiate the loan terms and sign a loan agreement.

Oregon Health Authority, Public Health Division, Office of Environmental Public Health, Drinking Water Program and the Oregon Business Development Department - Safe Drinking Water Revolving Loan Fund (SDWRLF)

Each federal fiscal year, EPA makes funds (as grants) available to states for the Safe Drinking Water Revolving Loan Fund (SDWRLF), http://www.oregon.gov/DHS/ph/dwp/srlf.shtml, a low interest loan program designed to finance drinking water system improvements needed to maintain compliance with the

Safe Drinking Water Act (SDWA). The program's financing is available to all sizes of public drinking water systems, although 15 percent of the funds based in accordance with federal law are reserved for systems serving fewer than 10,000 population. Municipal, nonprofit, and privately owned systems are eligible.

Only the following types of entities are eligible to apply for funding:

- Community water system: a public water system that has 15 or more service connections used by year-round residents, or that regularly serves 25 or more year-round residents.

- Nonprofit non-community water system: a public water system that is not a community water system, but that regularly serves at least 25 people and is recognized under Oregon law as a nonprofit corporation.

Oregon's grant request process begins by identifying and collecting information about current Oregon drinking water system project improvement needs. All projects identified with a *Letter of Interest* form will be used to create a list of drinking water system needs. That list of projects and estimated project financing is submitted to the EPA in Oregon's grant request to show how Oregon intends to use its grant allotment for that year.

Projects include planning, designing, or constructing drinking water facilities. Projects also include those needed to maintain compliance with current and future standards, and those that further public health protection goals of the federal SDWA and Oregon's Drinking Water Quality Act. Community water systems are eligible for loans up to $100,000 for source water protection measures to carry out elements of a Source Water Protection Management Plan, described above.

Timely action to protect public drinking water sources from contamination and other risks not only contributes to public health directly, but it can significantly reduce the cost of treatment required of a water system to comply with state and federal regulations. The type of action in question includes land easements, property barriers, reforestation, and investments in incentive or communication programs, as well as measures to prevent human actions that might accidentally or deliberately degrade or taint the water supply. Please refer to page 26 of the **Program Guidelines and Applicant's Handbook**, for a complete list of eligible source water protection projects.

This handbook also includes the Project Rating Criteria and the *Letter of Interest*. Instructions for completing the *Letter of Interest* are included. Additional help is available by calling the Oregon Health Authority, Public Health Division, Office of Environmental Public Health, Drinking Water Program, (971) 673-0405, or the Oregon Business Development Department, (503) 986-0123.

Oregon Department of Land Conservation and Development (DLCD) - Oregon Coastal Management Program (OCMP)

In addition, the DLCD staff is working with DEQ to provide technical assistance and grants to communities that are developing and implementing Water Quality Implementation Plans. This assistance includes. The DLCD Oregon Coastal Management Program (OCMP) assists coastal governments in their land use activities by providing federal money for comprehensive plan, zoning and development code revisions, and updates. These grants are awarded by DLCD and managed by the regional representatives, who collect, review and verify the forms (located further down this page).

All coastal jurisdictions that have acknowledged comprehensive plans approved by NOAA/Ocean and Coastal Resource Management for inclusion in the OCMP are eligible. In 2001 the Department developed, in coordination and collaboration with coastal local governments, a methodology for allocation, management, and distribution of coastal grant funds for local governments.

Development of the Oregon Coastal Nonpoint Pollution Control Program has also resulted in a few technical assistance programs that support the efforts of individuals, business owners, and local governments to reduce impacts on water quality:

1. The Oregon Coastal Management Program offers technical assistance grants to help local governments gain a better understanding of watershed interactions and to amend local ordinances such that water quality is better protected from the impacts of urban development. The following water quality related assistance is available:

    - Information technology
    - Coastal hazards
    - Stormwater management
    - Wetland & riparian resources
    - Resource and land inventories
    - Estuarine resources
    - Marine resources
    - Special Area Planning
    - Transportation
    - Public involvement
    - Capital improvements (e.g., stormwater) planning

2. Oregon Sea Grant http://seagrant.oregonstate.edu/extension/watersheds.html provides local governments with consultant staff time to identify priority actions to reduce development impacts on water quality, or draft ordinance amendments that will result in less impact to water quality.

3. The Oregon State Marine Board offers a "Clean Marina" certification. This program provides technical assistance and incentives to marina and boat yard managers who want to incorporate practices into their operations that reduce impacts on water quality.

Oregon Watershed Enhancement Board (OWEB) - Grants to help Oregonians

The Oregon Watershed Enhancement Board (OWEB) http://www.oweb.state.or.us/OWEB/GRANTS/index.shtml is a state agency that provides grants to help Oregonians improve rivers, lakes, streams, wetlands and fish and wildlife habitat. Community members and landowners use scientific criteria to decide jointly what needs to be done to conserve and improve rivers and natural habitat in the places where they live. OWEB grants are funded from the Oregon Lottery, federal dollars, and salmon license plate revenue.

This is an important piece in the implementation of Oregon's Salmon Plan. Current and past projects have included road relocation/closure/improvement projects, instream structure work, riparian fencing and revegetation, off stream water developments, and other management practices. OWEB accepts Grant applications for the following: Restoration, Education/Outreach, Technical Assistance, Monitoring, Land Acquisition, and Water Acquisition.

Oregon Department of Fish and Wildlife (ODFW) - Access and Habitat

The ODFW Access and Habitat Program is an incentive-based program to improve public hunting access and wildlife habitat on private lands in Oregon http://www.dfw.state.or.us/AH/. Individual and corporate landowners, conservation organizations and others are eligible for A&H Program funding. The purpose of this program is to improve resource access and wildlife habitat through cooperation between landowners, ODFW, and hunters to manage wildlife on private lands. The Access and Habitat Board recognizes projects that involve funding from other organizations and agencies. Projects may include in-kind contributions of labor, equipment, and material.

Typical projects that receive grants include:

- Wildlife forage seeding
- Water development
- Riparian protection
- Meadow fertilization
- Wetland restoration
- Juniper removal
- Noxious weed control
- Regulated hunt programs
- Law enforcement patrols
- Travel management areas
- Public hunting leases

Oregon Department of Fish and Wildlife (ODFW) - The Riparian Tax Incentive Program

The Riparian Tax Incentive Program, http://www.dfw.state.or.us/lands/tax_overview.asp, authorized by ORS 308A.350C308A.383, offers a property tax incentive to property owners for improving or maintaining qualifying riparian lands. Under this program, property owners receive complete property tax exemption for their riparian property. This can include land up to 100 feet from a stream. When the Riparian Tax Incentive law was passed in 1981, the Oregon Legislative Assembly declared that "it is in the best interest of the state to maintain, preserve, conserve and rehabilitate riparian lands to assure the protection of the soil, water, fish and wildlife resources of the state for the economic and social well-being of the state and its citizens."

Healthy riparian zones are important to the resource by providing: cooler water due to shading resulting in better habitat for salmon, trout and steelhead; more and better varieties of habitat for wildlife; increased water during summer low flow periods; erosion control by stabilizing streambanks with protective vegetation; and flood control.

Federal

U.S. Department of Agriculture, NRCS - Small Watershed Program and Flood Prevention Program (Public Law 83-566)

The purpose of this program is to assist federal, state, local agencies, local government sponsors, tribal governments, and program participants to protect watersheds from damage caused by erosion, floodwater, and sediment, to conserve and develop water and land resources; and to solve natural resource and related economic problems on a watershed basis. The program empowers local people or decision makers, builds partnerships, and requires local and state funding contributions. Both technical and financial assistance is available for watersheds not exceeding 250,000 acres. http://www.nrcs.usda.gov/programs/watershed/index.html

U.S. Department of Agriculture, NRCS - Wetlands Reserve Program (WRP)

The program provides an opportunity for landowners to receive financial incentives to enhance wetlands in exchange for retiring marginal lands from agriculture.

The program offers three enrollment options: permanent easements, 30-year easement, and restoration cost-share agreement (10-year agreement where USDA pays 75% of the restoration costs). http://www.nrcs.usda.gov/programs/wrp/

U.S. Department of Agriculture, NRCS - Wildlife Habitat Incentives Program (WHIP)

USDA and the participant enter into a five to ten year cost-share agreement for wildlife habitat development. Cost-share up to 75% is available for the cost of installing practices. http://www.nrcs.usda.gov/programs/whip/

U.S. Fish and Wildlife Service - Partners for Fish and Wildlife Program

The Service's Partners for Fish and Wildlife program, http://www.fws.gov/partners/ formerly named the Partners for Wildlife program; helps accomplish this mission by offering technical and financial assistance to private (non-federal) landowners to voluntarily restore wetlands and other fish and wildlife habitats on their land. The program emphasizes the reestablishment of native vegetation and ecological communities for the benefit of fish and wildlife in concert with the needs and desires of private landowners.

Private Foundations, Non-Profit Organizations

National Fish and Wildlife Foundation

The National Fish and Wildlife Foundation fosters cooperative partnerships to conserve wildlife, plants, and the habitats on which they depend. A General Challenge Grants Program and a Special Grants Program are offered. Grants are available to federal, state, and local governments, educational institutions, and non-profit organizations through General Challenge Grants. Stream restoration activities are eligible through this grant program. http://www.nfwf.org/AM/Template.cfm?Section=GrantPrograms

Oregon Governor's Fund for the Environment
A $2 million court settlement with an international shipping company resulted in the creation of the Oregon Governor's Fund for the Environment, which is a sustained granting program to benefit Oregon's rivers and streams. The grant program makes up to $300,000 a year available for projects that will restore the quality of Oregon's rivers and associated fish, wildlife and plants.

APPENDIX I

Recommended Programmatic BMPs By TMDL Listed Pollutant And Source

TMDL LISTED POLLUTANT	SOURCE OF POLLUTANT	PROGRAMMATIC BMPS	SOURCE(S)
TEMPERATURE	**Lack of Shading**	**Riparian Protection Ordinance** *Adopt a **Riparian Protection Ordinance** that provides a "no touch" riparian buffer on both sides of a waterbody with the width (in feet) based on the TMDL effectiveness shade and buffer width figures provided in the Implementation Ready TMDL WQMP in order to protect and maintain stream hyporheic flow and large woody debris.*	Source: *EPA Model Ordinances Language Website http://www.epa.gov/owowwtr1/nps/ordinance/mol1.htm The Stormwater Manager's Resource Center (SMRC) http://www.stormwatercenter.net/Model%20Ordinances/buffer_model_ordinance.htm*
	Reduced Summer and Late Fall Instream Flow	**Stormwater Management Ordinance** *Adopt a **Stormwater Management Ordinance** that requires all new, redevelopment, and retrofit projects to maintain post development peak runoff rate and average volume at levels that are similar to pre-development levels.*	Source: *EPA Stormwater Management Model Ordinance http://water.epa.gov/polwaste/nps/mol6.cfm*
	Reduced Summer and Late Fall Instream Flow	**Instream Flow Purchased** ***Purchase of Permanent Instream Transfers,** particularly during the summer and late fall flow periods. Oregon law allows for the permanent change of 'beneficial use' from an out-of-stream use such as irrigation or municipal, to an instream use to benefit habitat, water quality, and/or recreation. Details of instream transfers depend on stream conditions, water availability, and OWRD regulation patterns. Payments to landowners for permanent water ranges from $300 to $1,200 per acre-foot of water.*	Source: *The Freshwater Trust, Flow Restoration Program, Portland, Oregon http://www.thefreshwatertrust.org/conservation/stream-flow.*
	Stormwater Runoff	**Stormwater Management Ordinance** *Adopt a **Stormwater Management Ordinance** that requires all new, redevelopment, and retrofit projects to maintain post development peak runoff rate and average volume at levels that are similar to pre-development levels.*	Source: *EPA Stormwater Management Model Ordinance http://water.epa.gov/polwaste/nps/mol6.cfm*

Recommended Programmatic BMPs By TMDL Listed Pollutant And Source (Cont.)

TMDL LISTED POLLUTANT	SOURCE OF POLLUTANT	PROGRAMMATIC BMPS	SOURCE(S)
TEMPERATURE (Cont.)	**Constructed Facility Outflow**	**Stormwater Management Plan** *Develop a **Stormwater Management Plan** that identifies all existing surface water or groundwater releases from a constructed water quality treatment facility or other constructed facility or structure, e.g., settling pond, lake, reservoir, swimming pool, etc.*	Source: *City of Springfield (Oregon) Stormwater Management Plan, Prepared by: City of Springfield, Public Works Environmental Services Division, January 2004. (https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/5828/Springfield_Stormwater_Master_Plan.pdf?sequence=1)* *Greenville Stormwater Management Plan 2007, Prepared by City of Greenville Public Works Department, Engineering Division. (http://www.greenvillesc.gov/PublicWorks/forms/StormwaterManagementPlan/Greenville_Stormwater_Management_Plan.pdf)*
	Lack of Wetlands, Headwaters, and Groundwater	**Wetland Protection Ordinance** *Adopt a **Wetland Protection Ordinance** that includes protection of headwaters and other groundwater resources that provide cool water inflow from groundwater, hyporheic (near surface), wetland, or other sources into waterbody during the hottest time of year.*	Source: *Oregon Department of Land Conservation and Development Department of Environmental Quality Water Quality Model Code and Guidebook, October, 2000, Chapter 4 Zoning, Section 4.3.9(e) Wetland Protection Overlay Ordinance, Pages 4.47 to 4.54 http://www.deq.state.or.us/wq/nonpoint/links.htm*
	Lack of Forest Canopy	**Tree Protection Ordinance** *Adopt a **Tree Protection Ordinance** that retains at least 60% canopy coverage, which will hold water and reduce temperature increases on impervious surfaces.*	Source: *Oregon Department of Land Conservation and Development Department of Environmental Quality Water Quality Model Code and Guidebook, October, 2000, Chapter 4 Zoning, Section 4.4.8 Tree Preservation Ordinance, Pages 4.73 to 4.79 http://www.deq.state.or.us/wq/nonpoint/links.htmF*

Recommended Programmatic BMPs By TMDL Listed Pollutant And Source (Cont.)

TMDL LISTED POLLUTANT	SOURCE OF POLLUTANT	PROGRAMMATIC BMPS	SOURCE(S)
SEDIMENTATION (Turbidity)	**Lack of Riparian Areas**	**Riparian Protection Ordinance** *Adopt a **Riparian Protection Ordinance** that provides a "no touch" riparian buffer on both sides of a waterbody with the width (in feet) based on the TMDL effectiveness shade and buffer width figures provided in the Implementation Ready TMDL WQMP in order to protect and maintain hyporheic flow and Large Woody Debris to the stream.*	Source: *EPA Model Ordinances Language Website http://www.epa.gov/owowwtr1/nps/ordinance/mol1.htm The Stormwater Manager's Resource Center (SMRC) http://www.stormwatercenter.net/Model%20Ordinances/buffer_model_ordinance.htm*
	Stormwater Runoff	**Low Impact Development (LID) Ordinance** *Adopt a **Low Impact Development (LID) Ordinance** that requires all new, redevelopment, and retrofit projects to reduce impervious surfaces and use LID and other BMPs to infiltrate, filter, retain, evaporate, and slow down runoff close to its source to treat sediment from impervious surfaces.*	Source: *Survey 2005-2006 Recipients of the Low Impact Development Local Regulation Assistance Projects http://www.psparchives.com/publications/our_work/stormwater/lid/LIDRegulatoryAssistance2005-06Survey3-08.pdf* *See www.epa.gov/nps/lid for more information on Low Impact Development.*
	Exposed Soil	**Erosion and Sediment Control Ordinance** *Adopt an **Erosion and Sediment Control Ordinance** that controls soil erosion either during construction or by other land use activities. Violation is soil visible (turbid water) in waters of the state originating from the site.*	Source: *EPA Erosion and Sediment Control Model Ordinance http://water.epa.gov/polwaste/nps/mol2.cfm*
	Stormwater Runoff	**Stormwater Management Ordinance** *Adopt a **Stormwater Management Ordinance** that requires all new, redevelopment, and retrofit projects to control and treat soil laden stormwater runoff.*	Source: *EPA Stormwater Management Model Ordinance http://water.epa.gov/polwaste/nps/mol6.cfm*

Recommended Programmatic BMPs By TMDL Listed Pollutant And Source (Cont.)

TMDL LISTED POLLUTANT	SOURCE OF POLLUTANT	PROGRAMMATIC BMPS	SOURCE(S)
SEDIMENTATION (Turbidity) (Cont.)	**Stormwater Runoff**	**Stormwater Management Plan** *Develop a **Stormwater Management Plan** that identifies all existing stormwater management and conveyance systems, including existing surface waterbodies. An operation and maintenance schedule shall be provided for all proposed stormwater facilities and BMPs, and the party (or parties) responsible for maintenance and operation shall be identified. In general, stormwater management measures are called upon to meet one or more of four major watershed planning objectives, including:* ***Promoting groundwater recharge* ***Reducing pollutant loading to receiving waters* ***Minimizing or eliminating accelerated stream channel erosion* ***Minimizing or eliminating flooding*	Source: *City of Springfield (Oregon) Stormwater Management Plan, Prepared by: City of Springfield, Public Works Environmental Services Division, January 2004. (https://scholarsbank.uoregon.edu/xmlui/bitstream/handle/1794/5828/Springfield_Stormwater_Master_Plan.pdf?sequence=1)* *Greenville Stormwater Management Plan 2007, Prepared by City of Greenville Public Works Department, Engineering Division. (http://www.greenvillesc.gov/PublicWorks/forms/StormwaterManagementPlan/Greenville_Stormwater_Management_Plan.pdf)*
	Soil Erosion form Slopes	**Hillside Development (Steep Slopes) Protection Ordinance** *Adopt a **Hillside Development (Steep Slopes) Protection Ordinance** to minimize or stop soil erosion from steep slopes that are eroding (or subject to erosion from disturbance) causing sediment to enter into a waterbody.*	Source: *Oregon Department of Land Conservation and Development Department of Environmental Quality Water Quality Model Code and Guidebook, October, 2000, Chapter 4 Zoning, Section 4.3.9(c) Hillside Development (Steep Slopes), Pages 4.36 to 4.43 http://www.deq.state.or.us/wq/nonpoint/links.htm*
	Floodways/ Floodplains Erosion	**Floodway and Floodplain Overlay District Ordinance** *Adopt a **Floodway and Floodplain Overlay District Ordinance** that protects the floodway and floodplain from development and requires that any new, redevelopment, and retrofit projects to maintain post development peak runoff rate and average volume at levels that are similar to pre-development levels.*	Source: *Oregon Department of Land Conservation and Development Department of Environmental Quality, Water Quality Model Code and Guidebook, October, 2000, Chapter 4 Zoning, Section 4.3.9(d) Floodway and Floodplain Overlay District, pages 4.44 to 4.47 and Appendix, Additional Model Ordinances, Oregon Model Flood Damage Prevention Ordinance, pages A.13 to A.30 http://www.deq.state.or.us/wq/nonpoint/links.htm*

Recommended Programmatic BMPs By TMDL Listed Pollutant And Source (Cont.)

TMDL LISTED POLLUTANT	SOURCE OF POLLUTANT	PROGRAMMATIC BMPS	SOURCE(S)
BACTERIA (E coli and Fecal Coliform)	**Failing Onsite Sewage Disposals Systems**	**Local Community Onsite Loan Program** *Develop a **Local Community Loan Program** to provide low-cost financial assistance to individual homeowners to repair or replace substandard and failing on-site systems. A county or city may contract with DEQ to borrower funds through the agency's Clean Water State Revolving Fund (CWSRF) to establish a "local loan".*	Source: *Oregon DEQ, Clean Water State Revolving Fund (CWSRF) Loan Program, Description of the Components of a Proposed Local Community Loan Program Fact Sheet, http://www.deq.state.or.us/wq/loans/docs/srfforms/apps/lclprojdesc.pdf; and Local Community Loan Application Form, http://www.deq.state.or.us/wq/loans/docs/srfforms/apps/lclapp.pdf*
	Failing Onsite Sewage Disposals Systems	**Onsite Inspection and Maintenance Ordinance** *Develop an **Onsite Inspection and Maintenance Ordinance** to require onsite system inspection and maintenance to repair or replace substandard and failing on-site systems.*	Source: *Washtenaw County, Michigan Regulation for Inspection of Residential Onsite Disposal Systems at Property Transfer Ordinance, http://www.epa.gov/owow/nps/ordinance/documents/WashtenawCounty.pdf* University of Rhode Island, Water Quality Resource Center, Onsite Wastewater Resource Center, Kingston, RI *http://www.uri.edu/ce/wq/RESOURCES/wastewater/Management/PDFs/Model%20OWM%20Ordinance.pdf*
	Lack of Riparian Areas	**Riparian Protection Ordinance** *Adopt a **Riparian Protection Ordinance** that provides a "no touch" riparian buffer on both sides of a waterbody with the width (in feet) based on the TMDL effectiveness shade and buffer width figures provided in the Implementation Ready TMDL WQMP in order to protect and maintain hyporheic flow and Large Woody Debris to the stream.*	Source: *EPA Model Ordinances Language Website http://www.epa.gov/owowwtr1/nps/ordinance/mol1.htm The Stormwater Manager's Resource Center (SMRC) http://www.stormwatercenter.net/Model%20Ordinances/buffer_model_ordinance.htm*

Recommended Programmatic BMPs By TMDL Listed Pollutant And Source (Cont.)

TMDL LISTED POLLUTANT	SOURCE OF POLLUTANT	PROGRAMMATIC BMPS	SOURCE(S)
BACTERIA (E coli and Fecal Coliform) (Cont.)	**Wildlife Waste**	**No Wildlife Feeding Ordinance** *Adopt a **No Wildlife Feeding Ordinance** to limit the amount of wildlife waste entering waters of the state, including lakes, reservoirs, ponds, and other impoundments. (e.g., some communities patrol swimming beaches with dogs to keep waterfowl away during high recreational use times.*	Source: *New Jersey Department of Environmental Protection, Division of Water Quality, Municipal Stormwater Regulation Program Tier A Municipal Stormwater Guidance Document, April 2004, Chapter 7 – Model Ordinances, Model Ordinance - Wildlife Feeding, page 69* http://www.anjec.org/pdfs/ModelOrd-PetWaste.pdf
	Pet Waste	**Pet Waste Pick-Up Ordinance** *Adopt a **Pet Waste Pick-Up Ordinance** to encourage pet owners to pick up pet waste at home and in public area.*	Source: *New Jersey Department of Environmental Protection, Division of Water Quality, Municipal Stormwater Regulation Program Tier A Municipal Stormwater Guidance Document, April 2004, Chapter 7 – Model Ordinances, Model Ordinance - Pet Waste, page 64* http://www.anjec.org/pdfs/ModelOrd-PetWaste.pdf
	Bacteria Runoff From Impervious Surfaces	**Low Impact Development (LID) Ordinance** *Adopt a **Low Impact Development (LID) Ordinance** that requires all new, redevelopment, and retrofit projects to reduce impervious surfaces and use LID and other BMPs to infiltrate, filter, retain, evaporate, and slow down runoff close to its source to treat sediment from impervious surfaces.*[6]	Source: *Survey 2005-2006 Recipients of the Low Impact Development Local Regulation Assistance Projects* http://www.psparchives.com/publications/our_work/stormwater/lid/LIDRegulatoryAssistance2005-06Survey3-08.pdf *See www.epa.gov/nps/lid for more information on Low Impact Development.*

[6] See www.epa.gov/nps/lid for more information on Low Impact Development.

Recommended Programmatic BMPs By TMDL Listed Pollutant And Source (Cont.)

TMDL LISTED POLLUTANT	SOURCE OF POLLUTANT	PROGRAMMATIC BMPS	SOURCE(S)
BACTERIA (E coli and Fecal Coliform) (Cont.)	**Illegal or Illicit Discharges**[7]	**Illicit Discharge and Connection Ordinance**	Source: *EPA National Pollutant Discharge Elimination System (NPDES) Illicit Discharge Detection and Elimination Program Development BMP Fact Sheet: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=111&minmeasure=3 and EPA's Illicit Discharge and Connection Model Ordinance http://water.epa.gov/polwaste/nps/mol5.cfm*
		Adopt and Implement an Illicit Discharge and Connection Ordinance. *The objectives of this ordinance are: (1) To regulate the contribution of pollutants to the stormwater system by any user. (2) To prohibit illicit connections and discharges to the stormwater system. (3) To establish legal authority to carry out all inspection, surveillance, monitoring, and enforcement procedures necessary to ensure compliance with this ordinance.*	
NUTRIENTS (Nitrates and Phosphorus)	**Over Fertilization**	**Public Areas Fertilization Policy**	Source: *New Jersey Department of Environmental Protection, Division of Water Quality, Municipal Stormwater Regulation Program Tier A Municipal Stormwater Guidance Document, April 2004, Chapter 7 – Model Ordinances, Fertilizer Application Model Ordinance http://www.nj.gov/dep/watershedmgt/DOCS/TMDL/Fertilizer%20Application%20Model%20Ordinance.pdf*
		Adopt a ***Public Areas Fertilization Policy*** *to prevent over-application of fertilizers to public lawn and landscaped areas. Fertilizers applied to lawns are roughly equivalent to the application rates for row crops (Barth, 1995a).*	
	Nutrient Runoff From Impervious Surfaces	**Low Impact Development (LID) Ordinance**	Source: *Survey 2005-2006 Recipients of the Low Impact Development Local Regulation Assistance Projects http://www.psparchives.com/publications/our_work/stormwater/lid/LIDRegulatoryAssistance2005-06Survey3-08.pdf*
		Adopt a ***Low Impact Development (LID) Ordinance*** *that requires all new, redevelopment, and retrofit projects to reduce impervious surfaces and use LID and other BMPs to infiltrate, filter, retain, evaporate, and slow down runoff close to its source and treat nutrients from impervious surfaces.*	*See http://water.epa.gov/polwaste/green/ for more information on Low Impact Development.*

[7] Means an illegal and/or improper waste discharges into storm drainage systems and receiving waters.

Recommended Programmatic BMPs By TMDL Listed Pollutant And Source (Cont.)

TMDL LISTED POLLUTANT	SOURCE OF POLLUTANT	PROGRAMMATIC BMPS	SOURCE(S)
NUTRIENTS (Nitrates and Phosphorus) (Cont.)	**Exposed Soil**	**Erosion and Sediment Control Ordinance**	Source: *EPA Erosion and Sediment Control Model Ordinance* http://water.epa.gov/polwaste/nps/mol2.cfm
		*Adopt an **Erosion and Sediment Control Ordinance** that controls soil erosion either during construction or by other land use activities. Violation is soil visible (turbid water) in waters of the state.*	
	Stormwater Runoff	**Stormwater Management Ordinance**	Source: *EPA Stormwater Management Model Ordinance* http://water.epa.gov/polwaste/nps/mol6.cfm
		*Adopt a **Stormwater Management Ordinance** that requires all new, redevelopment, and retrofit projects to control and treat soil laden stormwater runoff.*	
	Nutrient Runoff	**Protecting Surface Water Sources of Drinking Water Ordinance**	Source: *Oregon DEQ, Water Quality Division, Model Ordinance: Protecting Surface Water Sources of Drinking Water Fact Sheet* http://www.deq.state.or.us/wq/pubs/factsheets/drinkingwater/ModelOrdinanceSurfaceWater.pdf
		*Adopt a **Protecting Surface Water Sources of Drinking Water Ordinance** to protect drinking water obtained from surface water sources.*	
	Nutrient Runoff	**Protecting Groundwater Sources of Drinking Water Ordinance**	Source: *Oregon DEQ, Water Quality Division, Model Ordinance: Protecting Groundwater Sources of Drinking Water Fact Sheet* http://www.deq.state.or.us/wq/pubs/factsheets/drinkingwater/ModelOrdinanceGroundwater.pdf
		*Adopt a **Protecting Groundwater Sources of Drinking Water Ordinance** to protect drinking water obtained from groundwater sources.*	
	Air Deposition	**Low Impact Development (LID) Ordinance**	Source: *Survey 2005-2006 Recipients of the Low Impact Development Local Regulation Assistance Projects* http://www.psparchives.com/publications/our_work/stormwater/lid/LIDRegulatoryAssistance2005-06Survey3-08.pdf
		*Adopt a **Low Impact Development (LID) Ordinance** that requires all new, redevelopment, and retrofit projects to reduce impervious surfaces and use LID and other BMPs to infiltrate, filter, retain, evaporate, and slow down runoff close to its source to treat nitrogen*	

		or phosphorus from air deposition onto impervious surfaces.	

Recommended Programmatic BMPs By TMDL Listed Pollutant And Source (Cont.)

TMDL LISTED POLLUTANT	SOURCE OF POLLUTANT	PROGRAMMATIC BMPS	SOURCE(S)
AQUATIC WEEDS OR ALGAE (Chlorophyll a)	**Same Sources Listed Above** For Nutrients	**Same Programmatic BMPs Listed Above For Sedimentation** (Turbidity) and Nutrients(Nitrates and Phosphorus)	***Same Source(s) Listed Above For*** **Sedimentation (Turbidity) and *Nutrients (Nitrates and Phosphorus)***
DISSOLVED OXYGEN	**Same Sources Listed Above For Nutrients (Nitrates and** Phosphorus)	**Same Programmatic BMPs Listed Above For** Nutrients(Nitrates and Phosphorus)	***Same Source(s) Listed Above For Nutrients(Nitrates and Phosphorus)***
TOXICS (Attached to Sediments)	**Same Sources Listed Above For Sedimentation** (Turbidity)	**Same Programmatic BMPs Listed Above For Sedimentation** (Turbidity) and Nutrients(Nitrates and Phosphorus)	***Same Source(s) Listed Above For*** **Sedimentation (Turbidity)**
TOXICS (In Water)	**Pesticides**	**Integrated Pest Management (IPM) Ordinance** *Adopt an **Integrated Pest Management (IPM) Ordinance** to develop effective plans, programs, and policies. Urban lawns receive an estimated five to seven pounds of pesticides per acre annually (Schueler, 1995b).*	Source: *Marin County, California Integrated Pest Management Ordinance (IPM) Ordinance http://www.up3project.org/documents/Marin-IPM-Ordinance.pdf*

	Same Sources Listed Above For Nutrients (Nitrates and Phosphorus)	**Same Programmatic BMPs Listed Above For Nutrients (Nitrates and Phosphorus)**	***Same Source(s) Listed Above For Nutrients (Nitrates and Phosphorus)***

APPENDIX J

Structural BMPs By TMDL Listed Pollutant, Source, Estimated Load Reduction, Costs, And What Is Included In The Costs

RECOMMENDED STRUCTURAL BMPS BY TMDL LISTED POLLUTANT					
TMDL LISTED POLLUTANT	**SOURCE OF POLLUTANT**	**STRUCTURAL BMPS**	**ESTIMATED LOAD REDUCTION***	**ESTIMATED COSTS**	**COSTS INCLUDED**
TEMPERATURE	**Lack of Shading**	**Riparian Restoration**	**100%**	**$10,000 to $15,000 per acre**	• Site Preparation • Planting • Maintenance • Program Costs • Recurring Payment for Lease
		***Restore Riparian Area** to **150-foot buffer on both sides** with native shrubs and trees that would grow and restore stream conditions to natural conditions.*			Source: *Oregon DEQ, Cost Estimate to Restore Riparian Forest Buffers and Improve Stream Habitat in the Willamette Basin, Oregon, March 2010* (http://www.deq.state.or.us/wq/tmdls/docs/WillametteRipCost030310.pdf)
	Lack of Cold Water Refugee	**Instream Restoration**	**Not Available**	**$10,000 to $15,000 per acre**	• Placement of Large Woody Debris • Placement of gravel, rocks, etc.
		***Restore** instream habitat complexity with placement of Large Woody Debris, and bed and bank material (e.g. gravel).*			Source: *Oregon DEQ, Cost Estimate to Restore Riparian Forest Buffers and Improve Stream Habitat in the Willamette Basin, Oregon, March 2010* (http://www.deq.state.or.us/wq/tmdls/docs/WillametteRipCost030310.pdf)

* For this draft, the estimated load reduction by BMP is in percent.

Structural BMPs By TMDL Listed Pollutant, Source, Estimated Load Reduction, Costs, And What Is Included In The Costs

RECOMMENDED STRUCTURAL BMPS BY TMDL LISTED POLLUTANT					
TMDL LISTED POLLUTANT	**SOURCE OF POLLUTANT**	**STRUCTURAL BMPS**	**ESTIMATED LOAD REDUCTION**	**ESTIMATED COSTS**	**COSTS INCLUDED**
TEMPERATURE (Cont.)	**Reduced Summer and Late Fall Instream Flow**	**Stormwater Vegetated Infiltration Basins**	**100%**	**Approximately $2 per ft^3**	• Design 0.25-acre basin with 2 to 3 percent of the site runoff infiltrates • Construction • Planting • Maintenance costs are estimated at 5 to 10 percent of construction costs.
		*Require construction of onsite or construct regional non-UIC[9] **Vegetated Infiltration Basins** that infiltrates stormwater and maintains dry weather flow.*			Source: *EPA National Pollutant Discharge Elimination System (NPDES) Stormwater Infiltration Basin BMP Fact Sheet*, (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=69&minmeasure=5)
	Reduced Summer and Late Fall Instream Flow	**Grassed Swales**	**100%**	**Approximately $0.50 per ft^2**	• Design less than 4 percent slope; 1 to 2 percent slope is recommended • Small fore-bay should be used at the front of the swale to trap incoming sediments • Construction • Planting • Maintenance costs approximately $1.09 per linear foot
		*Require construction of onsite or construct regional non-UIC **Grassed Swales** (a.k.a. grassed channel, dry swale, wet swale, biofilter, or bioswale) that infiltrates stormwater and maintains dry weather flow.*			*Sources: EPA National Pollutant Discharge Elimination System (NPDES) Stormwater Grassed Swales BMP Fact Sheet, (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=75&minmeasure=5) and EPA, National Management Measures to Control Nonpoint Source Pollution from Urban Areas, EPA-841-B-*

[1] See **Appendix G**

				05-004, November 2005 http://www.epa.gov/owow/nps/urbanmm/index.html

Structural BMPs By TMDL Listed Pollutant, Source, Estimated Load Reduction, Costs, And What Is Included In The Costs

RECOMMENDED STRUCTURAL BMPS BY TMDL LISTED POLLUTANT					
TMDL LISTED POLLUTANT	**SOURCE OF POLLUTANT**	**STRUCTURAL BMPS**	**ESTIMATED LOAD REDUCTION**	**ESTIMATED COSTS**	**COSTS INCLUDED**
TEMPERATURE (Cont.)	**Lack of Wetlands**	**Stormwater Wetlands**	**100%**	**Approximately $57,100 for a 1 acre-foot facility** **$289,000 for a 10 acre-foot facility** **$1,470,000 for a 100 acre-foot facility**	• Grading • Planting of wetland plants • Wetlands consume about 3 to 5 percent of the land that drains to them • Wetland volume needed to control the 10-year storm (ft^3). • Annual maintenance is 3% to 5%of the construction cost
		*Require construction of onsite or construct regional **Stormwater Wetlands** that provide infiltration and flow into receiving waterbody.*			Source: *EPA National Pollutant Discharge Elimination System (NPDES) Stormwater Wetlands BMP Fact Sheet*, (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=74&minmeasure=5)
	Lack of Forest Canopy	**Tree Planting**	**Varies According to Number and Total Area of Plantings**	**$2 to $3 Per Bare Root Tree** **$5 to $ 15 per Tree 1 - 5 gallon Container**	• Medium-sized tree can intercept 2,380 gallons of rain per year • By using native vegetation and keeping the area as natural as possible, maintenance efforts can be minimized. • Site Preparation • Tree Planted
		***Plant Trees** in right-of-ways and other open areas to provide adequate tree canopy coverage.*			Source: *NRCS, Oregon Conservation Component Costs List, FY2007 Draft, Section 3, Cost List Archive* (http://efotg.sc.egov.usda.gov/treemenuFS.aspx

Structural BMPs By TMDL Listed Pollutant, Source, Estimated Load Reduction, Costs, And What Is Included In The Costs

RECOMMENDED STRUCTURAL BMPS BY TMDL LISTED POLLUTANT					
TMDL LISTED POLLUTANT	**SOURCE OF POLLUTANT**	**STRUCTURAL BMPS**	**ESTIMATED LOAD REDUCTION**	**ESTIMATED COSTS**	**COSTS INCLUDED**
SEDIMENTATION (Turbidity)	**Lack of Riparian Areas**	**Riparian Restoration**	**80% for 100 Foot Buffer Width[9]** **95% for 200 Foot Buffer Width[10]**	**$10,000 to $15,00 per acre**	• Site Preparation • Planting • Maintenance • Program Costs • Recurring Payment for Lease
		Restore Riparian Area *and exposed soils with native shrubs and trees in order to restore natural conditions.*	DRAFT		Source: *Oregon DEQ, Cost Estimate to Restore Riparian Forest Buffers and Improve Stream Habitat in the Willamette Basin, Oregon, March 2010* http://www.deq.state.or.us/wq/tmdls/docs/WillametteRipCost030310.pdf
	Exposed Soil	**Erosion Control BMPs**	**50% to 90% Seeding** **53% to 99% Mulching** **70% to 93% Erosion Control Blankets**	**$0.05 to $0.25/yd² Seeding** **$0.21 to $0.87/ yd² Mulching** **$0.05 to 4.50/ yd² Erosion Control Blankets**	• Installation • Maintenance is 5% to 15% of the selected BMP installation costs
		Restore and Treat Exposed Soil Areas *with erosion control BMPs to prevent and control erosion.*			Source: *EPA, National Management Measures to Control Nonpoint Source Pollution from Urban Areas, EPA-841-B-05-004, November 2005* (http://www.epa.gov/owow/nps/urbanmm/index.html)

9 Source: Washington Ecology, LLC, Christopher W. May, *Stream-Riparian Ecosystems In The Puget Sound Lowland Eco-Region, A Review of Best Available Science*
10 Source: Washington Department of Ecology, *Wetlands in Washington State, Volume 1 – A Synthesis of Science*, March 2005.

Structural BMPs By TMDL Listed Pollutant, Source, Estimated Load Reduction, Costs, And What Is Included In The Costs

RECOMMENDED STRUCTURAL BMPS BY TMDL LISTED POLLUTANT					
TMDL LISTED POLLUTANT	**SOURCE OF POLLUTANT**	**STRUCTURAL BMPS**	**ESTIMATED LOAD REDUCTION**	**ESTIMATED COSTS**	**COSTS INCLUDED**
SEDIMENTATION (Turbidity) (Cont.)	**Construction Runoff**	**Construction Runoff Control/Treatment Facilities**	**60% TSS**	**$0.20 to $2.00 per cubic foot of storage (about $1,100 per acre of drainage).**	• Installation • Traps that provide pools with large length-to-width ratios have a greater chance of success • Maintenance costs are minimal
		***Install Onsite or Regional Sediment Traps** to settle sediment.*			Source: *EPA National Pollutant Discharge Elimination System (NPDES) Sediment Traps BMP Fact Sheet* *http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=59&minmeasure=4*
	Construction Runoff (Cont.)	**Construction Runoff Control/Treatment Facilities**	**55% to 100% TSS**	**$0.20 to $1.30 per cubic foot of storage (about $1,100 per acre of drainage) for less than 50,000 ft^3 of storage**	• Installation • Maintenance costs are minimal • Can be converted to a **Stormwater Wetland** for post-construction treatment. • The detention time should be at least 8 hours. • Remove sediment from the basin when the storage capacity has reached approximately 50 percent.
		***Install Onsite or Regional Sediment Basins and Rock Dams** to settle sediment.*		**$0.30 per cubic foot of storage for basins with greater than 50,000 ft^3 of storage**	Source: *EPA National Pollutant Discharge Elimination System (NPDES) Sediment Basins and Rock Dams BMP Fact Sheet* *http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=57&minmeasure=4*

Structural BMPs By TMDL Listed Pollutant, Source, Estimated Load Reduction, Costs, And What Is Included In The Costs

RECOMMENDED STRUCTURAL BMPS BY TMDL LISTED POLLUTANT					
TMDL LISTED POLLUTANT	**SOURCE OF POLLUTANT**	**STRUCTURAL BMPS**	**ESTIMATED LOAD REDUCTION**	**ESTIMATED COSTS**	**COSTS INCLUDED**
SEDIMENTATION (Turbidity) (Cont.)	**Stormwater Runoff**	**Stormwater Control/Treatment Facilities**	**75% TSS**	**$2 per ft^3 of storage for a 0.25-acre basin**	• Installation • Infiltration basin is sized to treat the runoff from a 1-inch storm • Maintenance is 5% to 15% of the selected BMP installation costs
		Install Onsite and/or Regional Infiltration Basin Facilities *to control and treat turbid runoff*			Source: *EPA National Pollutant Discharge Elimination System (NPDES) Infiltration Basin BMP Fact Sheet: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=69&minmeasure=5*
	Stormwater Runoff (Cont.)	**Stormwater Control/Treatment Facilities**	**61% TSS**	**$41,600 for a 1 acre-foot pond** **$239,000 for a 10 acre-foot pond**	• Installation • Designed to detain stormwater runoff for some minimum time (e.g., 24 hours) • Maintenance is typically estimated at about 3% to 5% of the construction cost
		Install Onsite and/or Regional Dry Detention Ponds *to control and treat turbid runoff*			Source: *EPA National Pollutant Discharge Elimination System (NPDES) Dry Detention Ponds BMP Fact Sheet: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=57&minmeasure=4*

Structural BMPs By TMDL Listed Pollutant, Source, Estimated Load Reduction, Costs, And What Is Included In The Costs

RECOMMENDED STRUCTURAL BMPS BY TMDL LISTED POLLUTANT					
TMDL LISTED POLLUTANT	**SOURCE OF POLLUTANT**	**STRUCTURAL BMPS**	**ESTIMATED LOAD REDUCTION**	**ESTIMATED COSTS**	**COSTS INCLUDED**
SEDIMENTATION (Turbidity) (Cont.)	**Stormwater Runoff (Cont.)**	**Street Sweeping**	**51% to 87% TSS**	**Approximately $150,000 per Street sweeper**	• Purchase a high efficiency vacuum sweeper • Annualized monthly sweeper costs per curb mile per year is $218 • For weekly sweeping, it is $946 per curb mile per year. • Operation & maintenance costs are approximately $15/curb mile.
		*Conduct **Regular Street Sweeping** of streets, parking lots, and other impervious surfaces with high-efficiency sweepers for removing the smallest possible particles.*			Sources: *EPA, National Management Measures to Control Nonpoint Source Pollution from Urban Areas, EPA-841-B-05-004, November 2005 http://www.epa.gov/owow/nps/urbanmm/index.html; and EPA's Preliminary Data Summary of Urban Stormwater Best Management Practices, EPA-821-R-99-012, August 1, 1999 http://www.epa.gov/npdes/pubs/usw_a.pdf*

Structural BMPs By TMDL Listed Pollutant, Source, Estimated Load Reduction, Costs, And What Is Included In The Costs

RECOMMENDED STRUCTURAL BMPS BY TMDL LISTED POLLUTANT					
TMDL LISTED POLLUTANT	**SOURCE OF POLLUTANT**	**STRUCTURAL BMPS**	**ESTIMATED LOAD REDUCTION**	**ESTIMATED COSTS**	**COSTS INCLUDED**
SEDIMENTATION (Turbidity) (Cont.)	**Stormwater Runoff (Cont.)**	**Stormwater Wetland**	**36% to 100% TSS**	**Approximately $57,100 for a 1 acre-foot facility** **$289,000 for a 10 acre-foot facility** **$1,470,000 for a 100 acre-foot facility**	• Grading • Planting of wetland plants • Wetlands consume about 3 to 5 percent of the land that drains to them • Wetland volume needed to control the 10-year storm (ft^3). • Annual maintenance is 3% to 5%of the construction cost
		*Require construction of onsite or construct regional **Stormwater Wetlands** that provide infiltration and removal of stormwater pollutants.*			Source: *EPA National Pollutant Discharge Elimination System (NPDES) Stormwater Wetlands BMP Fact Sheet*, (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=74&minmeasure=5)
	Erosion and Stormwater Runoff	**Porous Concrete and/or Asphalt Roads**	**90% to 99% TSS**	**$1.09 to $2.18 per ft^2**	• Do not install in areas where hazardous materials are loaded, unloaded, or stored. • Avoid high sediment loading areas. • Annual maintenance cost are $0.16 per $ft^2$to remove fine sediments from paver surface
		*Require construction of **Porous Concrete and/or Asphalt Roads** when constructing new roads or re-construction of a road.*			Source: *EPA, National Management Measures to Control Nonpoint Source Pollution from Urban Areas, EPA-841-B-05-004, November 2005 http://www.epa.gov/owow/nps/urbanmm/index.html*

Structural BMPs By TMDL Listed Pollutant, Source, Estimated Load Reduction, Costs, And What Is Included In The Costs

RECOMMENDED STRUCTURAL BMPS BY TMDL LISTED POLLUTANT					
TMDL LISTED POLLUTANT	**SOURCE OF POLLUTANT**	**STRUCTURAL BMPS**	**ESTIMATED LOAD REDUCTION**	**ESTIMATED COSTS**	**COSTS INCLUDED**
SEDIMENTATION (Turbidity) (Cont.)	**Soil Erosion form Road Ditches**	**Grassed Lined Swales**	**Approx. 81% TSS**	**Approximately $0.50 per ft²**	• Design less than 4 percent slope; 1 to 2 percent slope is recommended • Small forebay should be used at the front of the swale to trap incoming sediments • Construction • Planting • Maintenance costs approximately $1.09 per linear foot
		*Convert road ditches to **Grassed Swales** (a.k.a. grassed channel, dry swale, wet swale, biofilter, or bioswale) that to infiltrate and capture sediment.*			*Sources: EPA National Pollutant Discharge Elimination System (NPDES) Stormwater Grassed Swales BMP Fact Sheet, (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=75&minmeasure=5); and EPA, National Management Measures to Control Nonpoint Source Pollution from Urban Areas, EPA-841-B-05-004, November 2005 http://www.epa.gov/owow/nps/urbanmm/index.html*
BACTERIA (E coli and Fecal Coliform)	**Failing Onsite Sewage Disposals Systems**	**Onsite Systems Repair or Replacement**	**99% to 99.99%**	**$2,500 to $12,565 (Depending on Onsite System)**	• Material and Installation • Operation and Maintenance costs are between $6,845 to $36,406 over the design life of 20 to 30 years depending on onsite system • Maintenance costs are between $20 to $100 per month
		*For onsite systems, conduct an inspection and **Repair or Replace** substandard and failing on-site systems.*			*Source: EPA Onsite Wastewater Treatment Systems Manual Chapter 3, February 2002 EPA/625/R-00/008 http://www.epa.gov/owm/septic/pubs/septic_2002_osdm_all.pdf*

Structural BMPs By TMDL Listed Pollutant, Source, Estimated Load Reduction, Costs, And What Is Included In The Costs

RECOMMENDED STRUCTURAL BMPS BY TMDL LISTED POLLUTANT					
TMDL LISTED POLLUTANT	**SOURCE OF POLLUTANT**	**STRUCTURAL BMPS**	**ESTIMATED LOAD REDUCTION**	**ESTIMATED COSTS**	**COSTS INCLUDED**
BACTERIA (E coli and Fecal Coliform) (Cont.)	**Lack of Riparian Areas**	**Riparian Restoration**	**Approximately 80% (100 foot buffer width on each side)**	**$10,000 to $15,00 per acre**	• Site Preparation • Planting • Maintenance • Program Costs • Recurring Payment for Lease
		Restore Riparian Area *with native shrubs and trees that would grow and restore stream conditions to natural conditions.*			*Source: Stream-Riparian Ecosystems In The Puget Sound Lowland Eco-Region, A Review of Best Available Science, Christopher W. May, Watershed Ecology LLC, 2003 (Percent load reduction); and Oregon DEQ, Cost Estimate to Restore Riparian Forest Buffers and Improve Stream Habitat in the Willamette Basin, Oregon, March 2010* (http://www.deq.state.or.us/wq/tmdls/docs/WillametteRipCost030310.pdf
	Wildlife Waste	**Riparian Restoration**	**Same As Above**	**Same As Above**	**Same As Above**
		Restore Riparian Area *with native shrubs and trees that would grow and restore stream to natural conditions to capture bacteria.*			**Same As Above**
	Dog and Cat Waste	**Dog Run Parks**	**Varies According to Participation**	**Varies**	• Installation of public education signage, free “pooper scooper” bags, and sanitary trash receptacles • Adoption of a "pooper-scooper" ordinance

		*Establish **Dog Run Areas** in a dog park that is sited away from environmentally sensitive features and provides a safe off-leash fenced area.*			*Source: EPA National Pollutant Discharge Elimination System (NPDES) Pet Waste Management BMP Fact Sheet, http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=4&minmeasure=1*

Structural BMPs By TMDL Listed Pollutant, Source, Estimated Load Reduction, Costs, And What Is Included In The Costs

RECOMMENDED STRUCTURAL BMPS BY TMDL LISTED POLLUTANT					
TMDL LISTED POLLUTANT	**SOURCE OF POLLUTANT**	**STRUCTURAL BMPS**	**ESTIMATED LOAD REDUCTION**	**ESTIMATED COSTS**	**COSTS INCLUDED**
BACTERIA (E coli and Fecal Coliform) (Cont.)	**Bacteria Runoff From Impervious Surfaces**	**Stormwater Control/Treatment Facilities**	**Approximately90%**	**$2 per ft^3 of storage for a 0.25-acre basin**	• Installation • Infiltration basin is sized to treat the runoff from a 1-inch storm • Maintenance is 5% to 15% of the selected BMP installation costs
		Install Onsite and/or Regional Non UIC Infiltration Basin Facilities *to control and treat turbid runoff*			Source: *EPA National Pollutant Discharge Elimination System (NPDES) Infiltration Basin BMP Fact Sheet: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=69&minmeasure=5*
NUTRIENTS (Nitrates and Phosphorus)	**Nutrient Runoff From Impervious Surfaces**	**Pond/Wetland System**	**56±35% TP** **19±29% TN** **40±68% NOx**	**$57,100 for a 1 acre-foot facility** **$289,000 for a 10 acre-foot facility**	• Construction, design, and permitting cost • Stormwater runoff flows through the wet pond and into the shallow marsh • Maintenance is 3% to 5% of the selected BMP installation costs
		Construct Onsite and/or Regional Pond/Wetland System *that will infiltrate and treat nutrient laden waters.*			Source: *EPA National Pollutant Discharge Elimination System (NPDES) Stormwater Wetland BMP Fact Sheet: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=browse&Rbutton=detail&bmp=74&minmeasure=5*
	Nutrient Runoff From Impervious Surfaces (cont.)	**Dry Swale**	**Approximately 83% TP** **92% TN** **90% NOx**	**Approximately $0.50 per ft^2**	• Design less than 4 percent slope; 1 to 2 percent slope is recommended • Small forebay should be used at the front of the swale to trap incoming sediments • Construction • Planting • Maintenance costs approximately $1.09 per linear foot
		Construct Onsite and/or Regional Non UIC Dry Swale			Source: *EPA National Pollutant Discharge Elimination System (NPDES) Grassed Swales BMP Fact Sheet:*

		that will infiltrate and treat nutrient laden waters.			*http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=75*

Structural BMPs By TMDL Listed Pollutant, Source, Estimated Load Reduction, Costs, And What Is Included In The Costs

RECOMMENDED STRUCTURAL BMPS BY TMDL LISTED POLLUTANT					
TMDL LISTED POLLUTANT	**SOURCE OF POLLUTANT**	**STRUCTURAL BMPS**	**ESTIMATED LOAD REDUCTION**	**ESTIMATED COSTS**	**COSTS INCLUDED**
NUTRIENTS (Nitrates and Phosphorus) (Cont.)	**Nutrient Runoff From Impervious Surfaces (cont.)**	**Street Sweeping**	**51% to 87% TSS**	**Approximately $150,000**	• Purchase a high efficiency vacuum sweeper • Annualized monthly sweeper costs per curb mile per year is $218 • For weekly sweeping, it is $946 per curb mile per year. • Operation & maintenance costs are approximately $15/curb mile.
		*Conduct **Regular Street Sweeping** of streets, parking lots, and other impervious surfaces with sweepers that have good efficiencies for removing the tiniest particles.*			Sources: *EPA, National Management Measures to Control Nonpoint Source Pollution from Urban Areas, EPA-841-B-05-004, November 2005 http://www.epa.gov/owow/nps/urbanmm/index.html; and EPA's Preliminary Data Summary of Urban Stormwater Best Management Practices, EPA-821-R-99-012, August 1, 1999 http://www.epa.gov/npdes/pubs/usw_a.pdf*
	Exposed Soil	**Erosion Control BMPs**	**50% to 90% Seeding** **53% to 99% Mulching** **70% to 93% Erosion Control Blankets**	**$0.05 to $0.25/yd² Seeding** **$0.21 to $0.87/yd² Mulching** **$0.05 to 4.50/yd² Erosion Control Blankets**	• Installation • Maintenance is 5% to 15% of the selected BMP installation costs
		***Restore Exposed Soil Areas** with erosion control BMPs to prevent and control erosion.*			Source: *EPA, National Management Measures to Control Nonpoint Source Pollution from Urban Areas, EPA-841-B-05-004, November 2005* (http://www.epa.gov/owow/nps/urbanmm/index.html)
AQUATIC WEEDS OR ALGAE (Chlorophyll a)	**Same Sources Listed Above For Nutrients**	**Same Structural BMPs Listed Above For Nutrients**	**Same Load Reductions Listed Above For Nutrients**	**Same Costs Listed Above For Nutrients**	***Same Costs Included Listed Above For Nutrients***

					Same Sources Listed Above For Nutrients

Structural BMPs By TMDL Listed Pollutant, Source, Estimated Load Reduction, Costs, And What Is Included In The Costs

RECOMMENDED STRUCTURAL BMPS BY TMDL LISTED POLLUTANT					
TMDL LISTED POLLUTANT	**SOURCE OF POLLUTANT**	**STRUCTURAL BMPS**	**ESTIMATED LOAD REDUCTION**	**ESTIMATED COSTS**	**COSTS INCLUDED**
DISSOLVED OXYGEN	**Same Sources Listed Above For Nutrients (Nitrates and Phosphorus)**	**Same Structural BMPs Listed Above For Nutrients (Nitrates and Phosphorus)**	**Same Load Reductions Listed Above For Nutrients (Nitrates and Phosphorus)**	**Same Costs Listed Above For Nutrients (Nitrates and Phosphorus)**	***Same Costs Included Listed Above For Nutrients (Nitrates and Phosphorus)***
					Same Sources Listed Above For Nutrients (Nitrates and Phosphorus)
TOXICS (Attached to Sediment)	**Same Sources Listed Above For Sedimentation (Turbidity)**	**Same Structural BMPs Listed Above For Sedimentation (Turbidity)**	**Same Load Reductions Listed Above For Sedimentation (Turbidity)**	**Same Costs Listed Above For Sedimentation (Turbidity)**	***Same Costs Included Listed Above For Sedimentation (Turbidity)***
					Same Sources Listed Above For Sedimentation (Turbidity)
					Same Sources Listed Above For Sedimentation (Turbidity)
TOXICS (In Water)	**Same Sources Listed Above For Nutrients (Nitrates and Phosphorus)**	**Same Structural BMPs Listed Above For Nutrients (Nitrates and Phosphorus)**	**Same Load Reductions Listed Above For Nutrients (Nitrates and Phosphorus)**	**Same Costs Listed Above For Nutrients (Nitrates and Phosphorus)**	***Same Costs Included Listed Above For Nutrients (Nitrates and Phosphorus)***
					Same Sources Listed Above For Nutrients (Nitrates and Phosphorus)

APPENDIX K

When Stormwater Best Management Practices (BMPS) Are or Not Also Underground Injection Controls (UICS)

Guidelines in the use of this table: When stormwater BMPs are UICs numerous factors are evaluated as noted in this table. For a stormwater BMP to be granted Rule Authorization depends on the type of pre-treatment being used, land use(s), risk, likely quality and quantity of the discharge, required buffers/distance to water wells and sensitive areas, soils type and depth, confinement barrier, and local groundwater flow and depth to groundwater.

DISCLAIMER: A person that owns or operates stormwater BMPs is responsible for its performance and meeting all local, state, and federal regulations and design standards. If properly designed, installed and maintained, stormwater BMPs for infiltration (not injection) are advantageous for stormwater quality and quantity management considerations for preservation or reestablishment of the hydrologic cycle. However, owners/operators of stormwater infiltration BMPs must be careful to not cause the pollution of aquifers.

STORMWATER BMPs ARE OR NOT ALSO UICs

STORMWATER BMP[11]	POSSIBLE WPCF PERMIT	POSSIBLE RULE AUTHORIZED	LIKELY NOT UIC	DESIGN NOTES
Dry Well/Drill Hole	X	X		
French/Trench Drain	X	X		
Infiltration Drain Field	X	X		Large domestic on-sites under WPCF permit. If any used for (non-human use), e.g., kennels may be Rule Authorized if pre-treated.

11 Note: nomenclature of structural stormwater BMPs varies.

STORMWATER BMPs ARE OR NOT ALSO UNDERGROUND UICs (Cont.)

STORMWATER BMP[12]	POSSIBLE WPCF PERMIT	POSSIBLE RULE AUTHORIZED	LIKELY NOT UIC	DESIGN NOTES
Infiltration Trench (a.k.a. Infiltration Gallery)	X	X		Capped, Covered, or installed underground.
Infiltration Trench (without subsurface)			X	Open to surface **without** subsurface fluid distribution system (e.g., perforated pipes, drain tiles, membrane, drip, trench drain, etc.).
Infiltration Trench (with subsurface)	X	X		Open to surface **with** subsurface fluid distribution system (e.g., perforated pipes, drain tiles, membrane, drip, trench drain, etc.).
Infiltration Basin/Pond			X	Open to the surface **without** subsurface fluid distribution system (e.g., perforated pipes, drain tiles, membrane, drip, trench drain, etc.).
Infiltration Basin/Pond	X	X		**With** subsurface fluid distribution system (e.g., perforated pipes, drain tiles, membrane, drip, trench drain, etc.).
Sump/Tank/Vault	X			**With** subsurface discharge.
Sump/Tank/Vault			X	**Without** subsurface discharge or with discharge to surface or to municipal storm sewer.
Sand Filter and/or Organic Material	X	X		**With** subsurface fluid distribution system (e.g., perforated pipes, drain tiles, membrane, drip, trench drain, etc.).

12 Note: nomenclature of structural stormwater BMPs varies.

STORMWATER BMPs ARE OR NOT ALSO UNDERGROUND UICs (Cont.)

STORMWATER BMP[13]	POSSIBLE WPCF PERMIT	POSSIBLE RULE AUTHORIZED	LIKELY NOT UIC	DESIGN NOTES
Sand Filter and/or Organic Material			X	**Without** subsurface fluid distribution system (e.g., perforated pipes, drain tiles, membrane, drip, trench drain, etc.). (Note: Sand Filters are poor for metals removal).
Roof Downspouts/ Drains for a Single Residential site/building			X	**With** subsurface discharge. Single residential sites may register on volunteer basis.
Roof Downspouts/Drains for Commercial, industrial/residential sites and complexes.		X		**With** subsurface discharge. Commercial, industrial, and residential sites/ complexes/buildings required to register.
Porous Pavement (porous concrete and asphalt, pavers, etc.)			X	Generally for small parking and overflow parking area, flag lots, etc. that have minimal traffic. Requires vacuuming to prevent clogging and impacts to groundwater.
Wet Extended Detention Pond/Basin (a.k.a. Retention Pond)			X	
Constructed Stormwater Wetland			X	For water quality treatment only (not a created wetland per CWA Section 404 or 10.)
Dry Extended Detention Pond/Basin			X	

13 Note: nomenclature of structural stormwater BMPs varies.

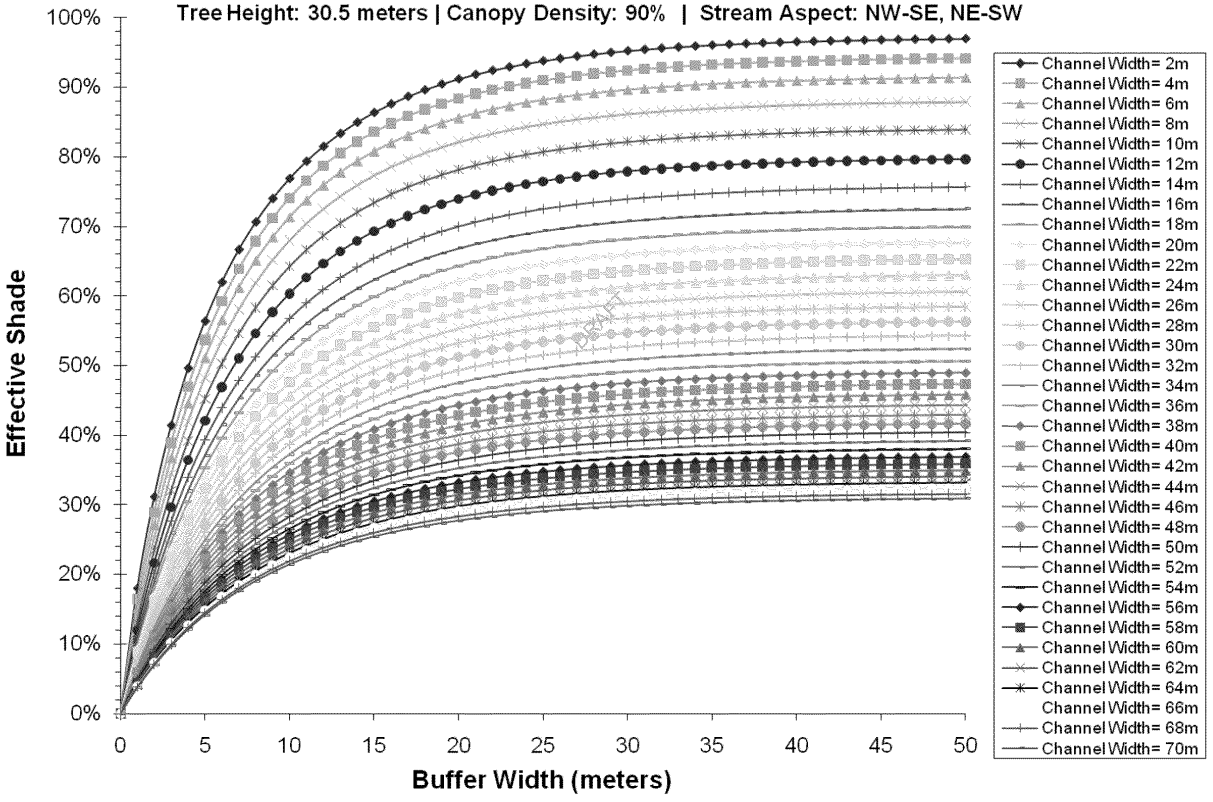
STORMWATER BMPs ARE OR NOT ALSO UNDERGROUND UICs (Cont.)

STORMWATER BMP[14]	POSSIBLE WPCF PERMIT	POSSIBLE RULE AUTHORIZED	LIKELY NOT UIC	DESIGN NOTES
Catch Basin/Inlet			X	
Proprietary Stormwater Treatment Systems			X	**Without** subsurface discharge. Examples: "Swirl Separator", "Hydro-Dynamics Structure", "StormTreat", etc.).
Swale, Vegetated and other covers	X			**With** subsurface fluid distribution system (e.g., perforated pipes, drain tiles, membrane, drip, trench drain, etc.).
Swale, Vegetated and other covers		X		Used in series **with** UIC or fluid distribution system (e.g., perforated pipes, drain tiles, membrane, drip, trench drain, etc.) for flood control or any other purpose.
Swale, Vegetated and other covers			X	**Without** subsurface fluid distribution system (e.g., perforated pipes, drain tiles, membrane, drip, trench drain, etc.)
Vegetated Filter Strip			X	
Bio-Retention			X	
Catch Basin Inserts			X	Usual proprietary systems.
Oil and Water Separators			X	Usual proprietary systems.

14 Note: nomenclature of structural stormwater BMPs varies.

APPENDIX L

Example Riparian Buffer Widths Determination
(1 Meter = 3.28 Feet)



APPENDIX M

Implementation and Effectiveness Monitoring by Pollutant

Implementation and Effectiveness Monitoring by TMDL Pollutant								
BMP	Programmatic	Structural	Most Effective	Recommended	Implementation Monitoring		Effectiveness Monitoring	
					Project Implementation Tally	Project Implementation Performance	Project Effectiveness	Program Effectiveness Performance
TEMPERATURE								
Riparian Protection Ordinance	X		X		Y/N	% of riparian area meeting buffer width target.	NA	Longterm (10+ year) stream temperature and stream flow monitoring at jurisdictional boundaries; 5 year shade and % site potential assessments from aerial photos or instream assessments
Wetland Protection Ordinance	X		X		Y/N	% of relevant area compliant, non-compliant, or unknown	NA	Low flow analysis from continuous stream discharge and precipitation data; Longterm (10+ year) stream temperature and stream flow monitoring at jurisdictional boundaries

Stormwater Management Ordinance	**X**			**X**	**Y/N**	**% of relevant area compliant, non-compliant, or unknown**	**Comparison of post development and pre-development peak and average volume levels at project level**	**Low flow analysis from continuous stream discharge and precipitation data; trends in peak and average stream flow; Longterm (10+ year) stream temperature and stream flow monitoring at jurisdictional boundaries**

Implementation and Effectiveness Monitoring by Pollutant (Cont.)

Implementation and Effectiveness Monitoring by TMDL Pollutant								
BMP	Programmatic	Structural	Most Effective	Recommended	Implementation Monitoring		Effectiveness Monitoring	
					Project Implementation Tally	Project Implementation Performance	Project Effectiveness	Program Effectiveness Performance
TEMPERATURE (Cont.)								
Instream Flow Purchased	X			X	# of purchases, quantity of water at critical periods	Volume of accumulated instream flow purchases	BACI comparison of stream flow above and below acquired instream flow.	Critical low flow period comparison from continuous stream discharge and precipitation data; Longterm (10+ year) stream temperature and stream flow monitoring at jurisdictional boundaries
Stormwater Management Plan	X			X	Y/N	% of relevant area compliant, non-compliant, or unknown	NA	Longterm (10+ year) stream temperature and stream flow monitoring at jurisdictional boundaries
Tree Protection Ordinance	X			X	Y/N	% canopy cover estimate	NA	Longterm (10+ year) stream temperature and stream flow monitoring at jurisdictional boundaries; 5 year % canopy cover from aerial photos

Riparian Restoration		**X**	**X**		**# of projects; area restored, area maintained**	**% survival estimates of native shrubs and trees**	**Solar pathfinder and densitometer shade measurements in project reach**	**Longterm (10+ year) stream temperature and stream flow monitoring at jurisdictional boundaries; 5 year shade and % site potential assessments from aerial photos or instream assessments**

Implementation and Effectiveness Monitoring by Pollutant (Cont.)

Implementation and Effectiveness Monitoring by TMDL Pollutant								
BMP	Programmatic	Structural	Most Effective	Recommended	Implementation Monitoring		Effectiveness Monitoring	
					Project Implementation Tally	Project Implementation Performance	Project Effectiveness	Program Effectiveness Performance
TEMPERATURE (Cont.)								
Stormwater Wetlands		X	X		# of projects; total catchment area draining to wetlands; # projects maintained	% of wetlands estimated to be operating as designed with vegetation and infiltration	% infiltration; BACI groundwater level and downstream stream discharge	Low flow analysis from continuous stream discharge and precipitation data; Longterm (10+ year) stream temperature and stream flow monitoring at jurisdictional boundaries
Instream Restoration		X		X	# of different projects completed, river miles restored, area restored	% of projects still in place and % which visually appear to be performing as designed	BACI comparison of local stream temperature or benthic macroinvertebrate communities.	Benthic stream macro invertebrate community health assessment and longterm (10+ year) stream temperature and stream flow monitoring at jurisdictional boundaries

Stormwater Vegetated Infiltration Basins		**X**		**X**	**# of projects completed and maintained; catchment area draining to basin**	**% of projects maintaining design criteria in volume and vegetation**	**BACI comparison of groundwater levels and stream recharge below project**	**Low flow analysis from continuous stream discharge and precipitation data; Longterm (10+ year) stream temperature and stream flow monitoring at jurisdictional boundaries**

Implementation and Effectiveness Monitoring by Pollutant (Cont.)

Implementation and Effectiveness Monitoring by TMDL Pollutant								
BMP	Programmatic	Structural	Most Effective	Recommended	Implementation Monitoring		Effectiveness Monitoring	
					Project Implementation Tally	Project Implementation Performance	Project Effectiveness	Program Effectiveness Performance
TEMPERATURE (Cont.)								
Grassed Swales		X		X	# of projects completed and maintained; catchment area draining to swales	% of projects maintaining design criteria in volume and vegetation	BACI comparison of groundwater levels and stream recharge below project	Low flow analysis from continuous stream discharge & precipitation data; Longterm (10+ year) stream temperature and stream flow monitoring at jurisdictional boundaries
Tree Planting		X		X	# of different projects completed, area planted, area maintained	Tree survival (visual estimate) at 1, 5, and 8 years, photo documentation	Solar pathfinder and densitometer shade measurements in project reach	Longterm (10+ year) stream temperature and stream flow monitoring at jurisdictional boundaries; 5 year % shade estimates from aerial photos
SEDIMENT (Turbidity)								

Erosion and Sediment Control Ordinance	**X**		**X**		**Y/N**	**% of inspected sites compliant or non-compliant**	**NA**	**Trends in macroinvertebrate fine sediment stressor scores, TSS or turbidity monitoring at jurisdictional boundaries**
Low Impact Development (LID) Ordinance	**X**		**X**		**Y/N**	**% of inspected sites compliant or non-compliant; drainage area and type of LID practices installed**	**NA**	**Trends in macroinvertebrate fine sediment stressor scores, TSS or turbidity monitoring at jurisdictional boundaries**

Implementation and Effectiveness Monitoring by Pollutant (Cont.)

Implementation and Effectiveness Monitoring by TMDL Pollutant								
BMP	Programmatic	Structural	Most Effective	Recommended	Implementation Monitoring		Effectiveness Monitoring	
					Project Implementation Tally	Project Implementation Performance	Project Effectiveness	Program Effectiveness Performance
SEDIMENT (Turbidity) (Cont.)								
Stormwater Management Ordinance	X		X		Y/N	% of relevant area compliant, non-compliant, or unknown	NA	Trends in macroinvertebrate fine sediment stressor scores, TSS or turbidity monitoring at jurisdictional boundaries
Riparian Protection Ordinance	X			X	Y/N	% of riparian area meeting buffer width target.	NA	Trends in macroinvertebrate fine sediment stressor scores, TSS or turbidity monitoring at jurisdictional boundaries
Hillside Development (Steep Slopes) Protection Ordinance	X			X	Y/N	% of inspected sites compliant or non-compliant	NA	Trends in macroinvertebrate fine sediment stressor scores, TSS or turbidity monitoring at jurisdictional boundaries

Floodway and Floodplain Overlay District Ordinance	**X**			**X**	**Y/N**	**% of sites compliant or non-compliant**	**NA**	**Trends in macroinvertebrate fine sediment stressor scores, TSS or turbidity monitoring at jurisdictional boundaries**
Construction Runoff Control/ Treatment Facilities		**x**	**x**		**# of facilities; area of drainage treated**	**estimated % facilities properly installed and maintained**	**% TSS removal by facility or turbidity reduction; % removal of visible suspended soil particles from runoff**	**Trends in macroinvertebrate fine sediment stressor scores, TSS or turbidity monitoring at jurisdictional boundaries or integrator sites below intensive development areas**

Implementation and Effectiveness Monitoring by Pollutant (Cont.)

Implementation and Effectiveness Monitoring by TMDL Pollutant								
BMP	Programmatic	Structural	Most Effective	Recommended	Implementation Monitoring		Effectiveness Monitoring	
					Project Implementation Tally	Project Implementation Performance	Project Effectiveness	Program Effectiveness Performance
SEDIMENT (Turbidity) (Cont.)								
Street Sweeping		X	X		miles swept	volume of debris swept	Before vs. after sweeping comparisons of runoff turbidity or TSS corrected for covariates like rainfall intensity, catchment gradient, others using multiple linear regression or other statistical methods.	Trends in macroinvertebrate fine sediment stressor scores, TSS or turbidity monitoring at jurisdictional boundaries or integrator sites below intensively swept areas

Grassed Lined Swales		X	X		# of swales; # maintained; total catchment area draining to swales	visual estimate of % swales properly functioning	BACI comparisons of development runoff turbidity or TSS corrected for covariates like rainfall intensity, catchment gradient, others using multiple linear regression or other statistical methods.	Trends in macroinvertebrate fine sediment stressor scores, TSS or turbidity monitoring at jurisdictional boundaries
Riparian Restoration		X		X	# of projects; area restored, area maintained	% survival estimates of native shrubs and trees	Before and after restoration comparisons of estimates of exposed soil and unstable banks.	Trends in macroinvertebrate fine sediment stressor scores, TSS or turbidity monitoring at jurisdictional boundaries

Implementation and Effectiveness Monitoring by Pollutant (Cont.)

Implementation and Effectiveness Monitoring by TMDL Pollutant								
BMP	Programmatic	Structural	Most Effective	Recommended	Implementation Monitoring		Effectiveness Monitoring	
					Project Implementation Tally	Project Implementation Performance	Project Effectiveness	Program Effectiveness Performance
SEDIMENT (Turbidity) (Cont.)								
Erosion Control BMPs		X		X	# of facilities; area of drainage treated	estimated % facilities properly installed and maintained	% TSS removal by facility or turbidity reduction; % removal of visible suspended soil particles from runoff	Trends in macroinvertebrate fine sediment stressor scores, TSS or turbidity monitoring at jurisdictional boundaries or integrator sites below intensive development areas
Stormwater Control/ Treatment Facilities		X		X	# of facilities; area of drainage treated	estimated % facilities properly installed and maintained	% TSS removal by facility or turbidity reduction; % removal of visible suspended soil particles from runoff	Trends in macroinvertebrate fine sediment stressor scores, TSS or turbidity monitoring at jurisdictional boundaries or integrator sites areas with known stormwater problems

Stormwater Wetland		**X**		**X**	**# of projects; total catchment area draining to wetlands; # projects maintained**	**% of wetlands estimated to be operating as designed with vegetation and infiltration**	**% infiltration and removal of TSS or turbidity reduction; BACI groundwater level and downstream stream discharge**	**Trends in macroinvertebrate fine sediment stressor scores, TSS, turbidity, and storm response (flashiness) monitoring at jurisdictional boundaries or integrator sites areas with significant wetland installation.**

Implementation and Effectiveness Monitoring by Pollutant (Cont.)

Implementation and Effectiveness Monitoring by TMDL Pollutant								
BMP	Programmatic	Structural	Most Effective	Recommended	Implementation Monitoring		Effectiveness Monitoring	
					Project Implementation Tally	Project Implementation Performance	Project Effectiveness	Program Effectiveness Performance
SEDIMENT (Turbidity) (Cont.)								
Porous Concrete and/or Asphalt Roads		X		X	# of projects; total catchment area draining to wetlands; # projects maintained	% of wetlands estimated to be operating as designed with vegetation and infiltration	BACI comparison of % infiltration and reduction of TSS or turbidity reduction in small drainages with porous surfaces installed	Trends in macroinvertebrate fine sediment stressor scores, TSS, turbidity, and storm runoff response (flashiness) monitoring at jurisdictional boundaries or integrator sites areas with significant wetland installation.
BACTERIA (E coli and Fecal Coliform)								
Onsite Inspection and Maintenance Ordinance	X		X		Y/N	% failure of inspected systems	NA	Trends in fecal indicator bacteria concentrations at jurisdictional boundaries

Local Community Loan Program	**X**		**X**		**Y/N**	**# of loans to fix failing systems**	**NA**	**Trends in fecal indicator bacteria concentrations at jurisdictional boundaries**

Implementation and Effectiveness Monitoring by Pollutant (Cont.)

Implementation and Effectiveness Monitoring by TMDL Pollutant								
BMP	Programmatic	Structural	Most Effective	Recommended	Implementation Monitoring		Effectiveness Monitoring	
					Project Implementation Tally	Project Implementation Performance	Project Effectiveness	Program Effectiveness Performance
BACTERIA (E coli and Fecal Coliform) (Cont.)								
Low Impact Development Ordinance	X		X		Y/N	drainage area and type of LID practices installed	NA	Trends in fecal indicator bacteria concentrations at jurisdictional boundaries and comparison of pre/post development storm runoff response
Pet Waste Pick-Up Ordinance	X		X		Y/N	% of parks and other high use areas with sign postings	Trends in fecal indicator bacteria concentrations at boundaries of high use pet areas. Covariates including use and precipitation.	Trends in fecal indicator bacteria concentrations at jurisdictional boundaries
Riparian Protection Ordinance		X		X	Y/N	% of riparian area meeting buffer width target.	NA	Trends in fecal indicator bacteria concentrations at jurisdictional boundaries

No Wildlife Feeding Ordinance		**X**		**X**	**Y/N**	**% of parks and other high use areas with sign postings**	**Trends in fecal indicator bacteria concentrations at boundaries of high use pet areas. Covariates including use and precipitation.**	**Trends in fecal indicator bacteria concentrations at jurisdictional boundaries**

Implementation and Effectiveness Monitoring by Pollutant (Cont.)

Implementation and Effectiveness Monitoring by TMDL Pollutant								
BMP	Programmatic	Structural	Most Effective	Recommended	Implementation Monitoring		Effectiveness Monitoring	
					Project Implementation Tally	Project Implementation Performance	Project Effectiveness	Program Effectiveness Performance
BACTERIA (E coli and Fecal Coliform) (cont.)								
Illicit Discharge and Connection Ordinance		X		X	Y/N	# and location of inspections; # of illicit discharges identified	Before and after/ above and below fecal indicator sampling	Trends in fecal indicator bacteria concentrations at jurisdictional boundaries
Stormwater Control/ Treatment Facilities		X	X		# of facilities; area of drainage treated	estimated % facilities properly installed and maintained	% fecal bacteria indicator removal by facility; % removal of visible suspended soil particles from runoff	Trends in fecal indicator bacteria concentrations at jurisdictional boundaries
Public Onsite Systems Repair or		X	X		# of systems in need of repair or replacement	# of systems repaired or replaced	Before and after dye tests or fecal bacteria indicator tests before and after/ above and below system	Trends in fecal indicator bacteria concentrations

Replacement								
Riparian Restoration		**X**		**X**	**# of projects; area restored, area maintained**	**% survival estimates of native shrubs and trees**	**Before and after restoration comparisons of estimates of exposed soil and unstable banks.**	**Trends in fecal indicator bacteria concentrations at jurisdictional boundaries**

Implementation and Effectiveness Monitoring by Pollutant (Cont.)

Implementation and Effectiveness Monitoring by TMDL Pollutant								
BMP	Programmatic	Structural	Most Effective	Recommended	Implementation Monitoring		Effectiveness Monitoring	
					Project Implementation Tally	Project Implementation Performance	Project Effectiveness	Program Effectiveness Performance
BACTERIA (E coli and Fecal Coliform) (cont.)								
Dog Run Parks		X		X	# of designated parks	estimates of park use	BACI fecal indicator organism monitoring bracketing dog run parks	Trends in fecal indicator bacteria concentrations at jurisdictional boundaries
Nutrients								
Erosion and Sediment Control Ordinance	X		X		Y/N	% of inspected sites compliant or non-compliant	NA	Trends in nitrate and phosphorus monitoring at jurisdictional boundaries
Low Impact Development (LID) Ordinance	X		X		Y/N	drainage area and type of LID practices installed	NA	Trends in nitrate and phosphorus concentrations at jurisdictional boundaries and

								comparison of pre/post development storm runoff response
Protecting Surface Water Sources of Drinking Water Ordinance	**X**			**X**	**Y/N**		**NA**	**Trends in nitrate and phosphorus monitoring at jurisdictional boundaries**

Implementation and Effectiveness Monitoring by Pollutant (Cont.)

Implementation and Effectiveness Monitoring by TMDL Pollutant								
BMP	Programmatic	Structural	Most Effective	Recommended	Implementation Monitoring		Effectiveness Monitoring	
					Project Implementation Tally	Project Implementation Performance	Project Effectiveness	Program Effectiveness Performance
Nutrients (Cont.)								
Protecting Groundwater Sources of Drinking Water Ordinance	X			X	Y/N		NA	Trends in nitrate and phosphorus monitoring at jurisdictional boundaries
Public Areas Fertilization Policy	X			X	Y/N	annual quantity of fertilizer applied	BACI comparison of nitrogen or phosphorus in runoff from public areas	Trends in nitrate and phosphorus monitoring at jurisdictional boundaries
Pond/ Wetland System		X	X		# and drainage area of systems; number of	Estimate of % of systems appearing to work as designed	Above vs. below % reductions in nitrogen and phosphorus	Trends in nitrate and phosphorus monitoring at jurisdictional boundaries or integrator sites below intensive

					systems maintained		concentrations	development areas

Implementation and Effectiveness Monitoring by Pollutant (Cont.)

Implementation and Effectiveness Monitoring by TMDL Pollutant								
BMP	Programmatic	Structural	Most Effective	Recommended	Implementation Monitoring		Effectiveness Monitoring	
					Project Implementation Tally	Project Implementation Performance	Project Effectiveness	Program Effectiveness Performance
Nutrients (Cont.)								
Dry Swale		X	X		# and drainage area of systems; number of systems maintained	Estimate of % of swales functioning properly	BACI comparisons of development runoff nitrogen and phosphorus concentrations corrected for covariates like rainfall intensity, catchment gradient, others using multiple linear regression or other statistical methods.	Trends in nitrate and phosphorus monitoring at jurisdictional boundaries or integrator sites below intensive development areas
Street Sweeping		X		X	miles swept	volume of debris swept	Before vs. after sweeping comparisons of runoff nitrate and	Trends in nitrate and phosphorus monitoring at jurisdictional boundaries or integrator sites below intensive

							phosphorus concentrations.	development areas
Erosion Control BMPs		**X**		**X**	**# of facilities; area of drainage treated**	**estimated % facilities properly installed and maintained**	**% nitrate and phosphorus removal by facility; % removal of visible suspended soil particles from runoff**	**Trends in nitrate and phosphorus monitoring at jurisdictional boundaries or integrator sites below intensive development areas**

APPENDIX N

Glossary

Best Management Practice
Means "...a practice or combination of practices considered by a State [or authorized Tribe] to be the most effective means (including technological, economic and institutional considerations) of preventing or reducing the amount of pollution by nonpoint sources to a level compatible with water quality goals." (40 CFR 130.2(Q))

Designated Management Agency (DMA)
Means a federal, state, or local governmental agency that has legal authority over a sector or source contributing pollutants, and is identified as such by the Department of Environmental Quality in a TMDL.

Director
Means the Director of the Department of Environmental Quality or the Director's authorized designee.

Floodplain
Means a generally flat, low-lying area adjacent to a stream or river that is subjected to inundation during high flows. The relative elevation of different floodplains determines their frequency of flooding, ranging from rare, and severe storm events to flows experienced several times a year. For example, a "100-year floodplain" would include the area of inundation that has a frequency of occurring, on average, once every 100 years.

Hydrologic Unit Code (HUC)
Means a multi-scale numeric code used by the U.S. Geological Survey to classify major areas of surface drainage in the United States. The code includes fields for geographic regions, geographic sub regions, major river basins, and subbasins. The third field of the code generally corresponds to the major river basins named in OAR chapter 340, division 41. The fourth field generally corresponds to the subbasins typically addressed in TMDLs.

Illicit Connections
Means an illegal and/or improper waste discharges into storm drainage systems and receiving waters.

Impervious Cover
Means any surface in the urban landscape that cannot effectively absorb or infiltrate rainfall; for example, sidewalks, rooftops, roads, and parking lots.

Imperviousness
Means the percentage of impervious cover by area within a development site or watershed, often calculated by identifying impervious surfaces from aerial photographs or maps.

Local Advisory Group
Means a group of people with experience and interest in a specific watershed or subbasin that is designated by the Department to provide local input during TMDL development.

Low Impact Development
LID is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product.

Management Strategies
Means measures to control the addition of pollutants to waters of the state and includes application of pollutant control practices, technologies, processes, siting criteria, operating methods, best management practices or other alternatives.

National Pollutant Discharge Elimination System (NPDES)
Means, as established by Section 402 of the Clean Water Act, this federally mandated permit system is used for regulating point sources, which include discharges from industrial and municipal facilities and stormwater discharges from discrete conveyances such as pipes or channels.

Performance Monitoring
Means monitoring implementation of management strategies, including sector-specific and source-specific implementation plans, and resulting water quality changes.

Pollutant
Has the meaning provided in the Federal Water Pollution Control Act Section 502 (33 USC Section 1362).

Reasonable Assurance
Means a demonstration that a TMDL will be implemented by federal, state, or local governments or individuals through regulatory or voluntary actions including management strategies or other controls.

Riparian Buffer
Means an area of land and water that is important to the integrity and quality of a stream, river, lake, wetland, or other body of water where a) critically important ecological processes and water pollution control functions take place, and b) development may be restricted or prohibited for these reasons.
Sector

Means a category or group of similar nonpoint source activities such as forestry, agriculture, recreation, urban development, or mining.

Sector-Specific Implementation Plan or Source-Specific Implementation Plan
In the context of a TMDL means a plan for implementing a Water Quality Management Plan for a specific sector or source not subject to permit requirements in ORS 486.050.

Source
Means any process, practice, activity, or resulting condition that causes or may cause pollution or the introduction of pollutants to a waterbody.

Subbasin
Means the designation in the fourth field of the U.S. Geological Survey Hydrologic Unit Code.

Surrogate Measures
Means substitute methods or parameters used in a TMDL to represent pollutants.

Total Maximum Daily Load (TMDL)
Means a written quantitative plan and analysis for attaining and maintaining water quality standards and includes the elements described in OAR 340-042-0040. These elements include a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet state water quality standards, allocations of portions of that amount to the pollutant sources or sectors, and a Water Quality Management Plan to achieve water quality standards.

TMDL Implementation Plan
The elements of an implementation plan are described in OAR 340-042-0080.

Waterbody
Means any surface waters of the state.

Watershed
Means an area of land that drains water, sediment and dissolved materials to a common receiving body or outlet. The term is not restricted to surface water runoff and includes interactions with subsurface water. Watersheds vary from the largest river basins to just acres or less in size. In urban watershed management, a watershed is seen as all the land that contributes runoff to a particular water body.

Water Quality Management Plan (WQMP)
Means the element of a TMDL describing strategies to achieve allocations identified in the TMDL to attain water quality standards. The elements of a WQMP are described in OAR 340-042-0040(4) (l).

Zoning

Means a set of local government regulations and requirements that govern the use, placement, spacing and size of buildings and lots (as well as other types of land uses) within specific areas designated as zones primarily dedicated to certain land use types or patterns.